Food and Agriculture
Organization of the
United Nations

Exemplary forest management revisited

Insights from successes and challenges

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Exemplary forest management revisited

Insights from successes and challenges

Food and Agriculture Organization of the United Nations
Rome, 2025

Required citation:
FAO. 2025. *Exemplary forest management revisited – Insights from successes and challenges*. Rome.
https://doi.org/10.4060/cd7052en

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ISBN 978-92-5-140138-5
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ACKNOWLEDGEMENTS

We would like to express our gratitude to the many individuals and organizations that provide invaluable contributions to this initiative and the publication.

The initiative was implemented under the technical leadership of Kenichi Shono. Unna Chokkalingam provided technical support for the initiative from design to implementation, playing a vital role in overall coordination. We are also thankful to Thomas Hofer and Tiina Vähänen for their supervision and support, which were crucial to the project's success. Special thanks go to Patrick Durst for originating the idea and providing peer review, and to Chris Brown and César Sabogal for their valuable insights in shaping the study.

We also acknowledge our partner organizations, CATIE, CIFOR-ICRAF and RECOFTC, for their excellent collaboration and support.

This study was made possible through the commitment and effort of the case study authors who worked tirelessly to complete the revisits.

Financial support was provided by the Ministry of Agriculture, Forestry and Fisheries of Japan through the FAO-implemented project "Enhancing community resilience to climate change in mountain watersheds" which was implemented from 2020 to 2024 under the technical leadership of Rikiya Konishi.

The Wyss Academy for Nature at the University of Bern is thanked for supporting the regional workshop in Asia and the Pacific.

Regional coordination was effectively managed by Thuy Dang for Asia and the Pacific; Richard Sufo for Central Africa; and Fernando Carrera, Cesar Sabogal and Roger Villalobos for Latin America and the Caribbean.

We appreciate the contributions of Nathalie Faure, Chandra Shekhar Silori, Thuy Dang, and Ronnakorn Triraganon from RECOFTC, whose review and feedback enhanced the quality of this work. Leadership at RECOFTC, particularly David Ganz, is acknowledged for their strategic direction. We also express our gratitude to FAO colleagues in regional offices, namely Illias Animon, Yuka Irie, Li Jia, Edward Kilawe, Jeremie Mbairamadji, Pieter van Lierop and Sheila Wertz-Kanounnikoff for their valuable inputs.

Special thanks to Richard Eba'a Atyi, CIFOR Regional Coordinator for Central Africa, for his insights.

Rumiko Ito supported the publication process.

Finally, we would like to thank Brett Shapiro for manuscript editing and Meagan Mason for proofreading, and acknowledge the graphic design contributions from Kate Ferrucci.

ABBREVIATIONS

AAC	annual allowable cut
AATL	Association of Lossi Land Rights Holders, Congo
ABP	Australian Bluegum Plantations
ABT	Autoridad de Fiscalización y Control Social de Bosques y Tierras (Authority for the Supervision and Social Control of Forests and Land), Bolivia (Plurinational State of)
ACFAP	Congolese Agency for Wildlife and Protected Areas
ACOFOP	Association of Forest Communities of Petén, Guatemala
ACR	Regional Conservation Area, Peru
AFISAP	Forestry Association of San Andrés Petén, Guatemala
ASPROBOS	Association for the Protection of the Dry Forests of Caserío El Choloque, Peru
AUTEX	Authorizations for Forest Exploration, Brazil
BBPP	Bioko Biodiversity Protection Programme, Equatorial Guinea
CAR	Rural Environmental Registry, Brazil
CATIE	Tropical Agricultural Research and Higher Education Center
CBFMA	Community-Based Forest Management Agreement, Philippines
CFAD	Concession Forestière sous Aménagement Durable (Forest Concession under Sustainable Management), Gabon
CFi	community fisheries, Cambodia
CFUG	community forest user group, Nepal
CFiMC	community fishery management committee, Cambodia
CFiMP	community fishery management plan, Cambodia
CIFOR-ICRAF	Center for International Forestry Research and World Agroforestry
CIRAD	French Agricultural Research Centre for International Development
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
cm	centimetre
COMARU	Mixed Cooperative of Producers and Extractivists of the Iratapuru River, Brazil
CONAF	National Forestry Services, Chile
CONAP	National Council of Protected Areas, Guatemala
COPNAG	Central de Organizaciones de los Pueblos Nativos Guarayos (Central Organization of Guarayos Native Peoples), Bolivia (Plurinational State of)
CRDPI	Research Centre on the Sustainability and Productivity of Industrial Plantations, Congo
dbh	diameter at breast height
DENR	Department of Environment and Natural Resources, Philippines
DRT	Diamond Raya Timber, Indonesia
ECOFAC	Conservation and Rational Utilization of Forestry Ecosystems in Central Africa
EDC	Eco-development Committee, India
EnLiFT	Enhancing Livelihoods from Improved Forest Management in Nepal
ESSC	Environmental Science for Social Change, Philippines
FAO	Food and Agriculture Organization of the United Nations

FiA	Fishery Administration, Cambodia
FMP	forest management plan
FMU	forest management unit
FSC	Forest Stewardship Council
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeitt
ha	hectare
HACCP	hazard analysis and critical control point
HCV	high conservation value
HTR	Community Plantation Forest, Indonesia
ICMBio	Chico Mendes Institute for Biodiversity Conservation, Brazil
INDEFOR-AP	Instituto Nacional de Desarrollo Forestal y gestión del sistema de Áreas Protegidas (National Institute for Forestry Development and Management of the Protected Areas System), Equatorial Guinea
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
KASAMA	Kalibo Save the Mangroves Association, Philippines
KDTI	Kawasan Dengan Tujuan Istimewa (Special Purpose Zone), Indonesia
km	kilometre
KOICA	Korea International Cooperation Agency
LEI	Lembaga Ekolabel Indonesia
LTFT	Lake Taupo Forest Trust, New Zealand
m	metre
MBR	Maya Biosphere Reserve, Guatemala
MINEF	Ministry of the Environment and Forests, Camerron
MINFOF	Ministry of Forests and Wildlife, Cameroon
MoEF	Ministry of Environment and Forestry, Indonesia
NGO	non-government organization
NTFP	non-timber forest product
NWFP	non-wood forest product
PTCF	Periyar Tiger Conservation Foundation, India
PTR	Periyar Tiger Reserve, India
RDSI	Iratapuru River Sustainable Development Reserve, Brazil
RECOFTC	Regional Community Forestry Training Center for Asia and the Pacific
REDD+	Reducing Emissions from Deforestation and forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks
SDG	Sustainable Development Goal
SEMA/AP	Secretary of State for the Environment of the Government of the State of Amapá, Brazil
SEMARNAT	Secretariat of Environment and Natural Resources, Mexico
SERFOR	National Forestry and Wildlife Service, Peru
SFM	sustainable forest management
TCO	*Tierras Comunitarias de Origen* (native community lands), Bolivia (Plurinational State of)
TNBBS	Bukit Barisan Selatan National Park, Indonesia

TPTI	Indonesian selective cutting and replanting system
UFA	*unité forestière d'aménagement* (forest planning unit)
UNDP	United Nations Development Programme
UNGE	National University of Equatorial Guinea
UNHCR	United Nations High Commissioner for Refugees
USAID	United States Agency for International Development
WWF	World Wildlife Fund
WFP	World Food Programme

CURRENCIES

AUD	Australian dollar
BRL	Brazilian real
CNY	Chinese yuan
IDR	Indonesian rupiah
JPY	Japanese yen
MXN	Mexican peso
NZD	New Zealand dollar
PHP	Philippine peso
USD	United States dollar
XAF	Central African CFA franc

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INTRODUCTION

Unna Chokkalingam, International Forestry Expert, and **Kenichi Shono**, FAO

BACKGROUND

Deforestation and land degradation threaten the livelihoods, well-being, food, water, energy security and resilience of millions of people around the world. Between 20 to 40 percent of the global land area is degraded or degrading to varying extents and degrees (UNCCD, 2022), with a resulting loss of critical ecosystem services.

The importance of sustainable forest management (SFM) as a response to continuing deforestation and forest degradation, and the associated decline in productivity and supply of ecosystem services, are widely recognized. Sustainable forest management contributes significantly to the achievement of the 2030 Agenda for Sustainable Development on multiple fronts, with the most direct impact on Sustainable Development Goal (SDG) 15 "Life on land". As well, SFM is a key element of the United Nations Strategic Plan for Forests 2017–2030, which provides a global framework for action at all levels to sustainably manage all types of forests and trees outside forests, and to halt deforestation and forest degradation. Furthermore, SFM is a crucial component of the global restoration movement and response to climate change.

In 2001, FAO launched an initiative titled *In Search of Excellence* to identify exemplary cases of SFM in Asia and the Pacific,[1] Central Africa,[2] and Latin America and the Caribbean.[3] The initiative aimed to recognize and draw attention to the many positive and successful forest management efforts taking place globally, particularly in the tropical regions. The collection of case studies advanced understanding of the common elements of what constitutes good forest management and highlighted the many people who are striving for excellence in forest management, encouraging others to emulate these positive efforts.

In the past 10 to 20 years, international dialogue around forests and the expected role of forests has evolved, and much has changed in terms of policy, socioeconomic and environmental outlooks. One of the principles of SFM is that it should always be responsive and adaptive to changing knowledge and needs. Although these past highlighted cases exhibited core components of good forest management at the time, some of them struggled, while others remained viable and continue to provide a range of ecological and socioeconomic benefits.

This new initiative to follow up on the *In Search of Excellence* aimed to identify how recent policy, socioeconomic and environmental changes have influenced forest management and draws lessons on long-term success factors for SFM. The revisit includes cases that remained successful as well as those that declined for various reasons.

THE CONCEPT OF SUSTAINABLE FOREST MANAGEMENT AND PROGRESS MADE

The concept of SFM evolved following an acute scarcity of timber in the 18th century in Europe and the idea that forest productivity should be maintained on a sustainable basis (von Carlowitz, 1713).

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[1] For more information please visit www.fao.org/4/ae542e/ae542e00.htm

[2] For more information please visit www.fao.org/4/y4853e/y4853e00.htm

[3] For more information please visit https://openknowledge.fao.org/items/dc774d86-471c-4680-975c-4696e486b36e

Later, the concept was broadened to include economic, environmental, social and cultural aspects. A number of international processes were initiated to arrive at a common set of SFM criteria and indicators for monitoring at the national and forest management unit levels (Castañeda, 2000). Voluntary market-based systems of certification of SFM were developed and put in place.

The United Nations (2007) resolution defines SFM as "a dynamic and evolving concept that aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations". As defined, SFM seeks to balance the provision of various forest products and services and to maintain them for the long term (Shono and Jonsson, 2022). Furthermore, the following seven thematic elements have been identified as a reference framework for SFM: (i) extent of forest resources; (ii) forest biodiversity; (iii) forest health and vitality; (iv) productive functions of forest resources; (v) protective functions of forest resources; (vi) socioeconomic functions of forests; and (vii) legal, policy and institutional frameworks.

There is no globally agreed-upon set of indicators for the identified criteria, and indicators are to be adapted to the conditions and needs of each country. There is no hierarchy among the economic, environmental and social pillars of SFM, and the interactions among the components as well as the impacts of external cross-sectoral drivers are not specifically addressed.

Prins *et al.* (2023) argue that society's demands on forests have changed enormously over the last 30 years and that the concept of SFM as defined is no longer fit for purpose. Major changes that affect the concept of SFM are:

- The recognition of the multiple and complex interactions between forest policy and other policy areas, necessitating complex trade-offs – for example between climate change mitigation and wood production – which challenges the possibility of adopting a balanced multi-functional approach.
- The growing recognition of the importance of natural capital as a basis or precondition for sustainability, with the prioritization of ecosystem services and biodiversity over the productive functions of the forest.
- The arrival of new legally binding international policy instruments with different content and priorities that make it difficult for the existing, national-level, non-legally binding definitions of SFM to coexist. Differences between European Union-level rules and those of international forest certification systems which currently cover 463 million ha would pose significant problems for forest managers.

Shono and Jonsson (2022) report that substantial progress has been made towards the achievement of SFM in recent decades based on their analysis of FAO's Global Forest Resources Assessment 2020 data (FAO, 2020) as well as the latest SDG monitoring results confirming the global expansion of SFM (United Nations, 2020). They measured progress towards SFM through proxy indicators covering economic, social and environmental aspects, including changes in forest cover and condition, presence of enabling conditions, expression of intent to manage forests sustainably, and the application of instruments that mandate sustainable management of forests. However, progress was found to be uneven, with forest management deteriorating in the tropical low-income countries despite the presence of some of the enabling frameworks for SFM and the high proportion of forest area designated for conservation.

DEFINING "EXCELLENCE" IN FOREST MANAGEMENT

In the previous *In Search of Excellence* initiative, there was considerable discussion on what constitutes sustainable or "good" forest management and how this concept can be defined. It was concluded that the answer would depend on the local conditions and, more importantly, on the widely differing expectations and perceptions people have on forest management. Although it would not be practical to reach a consensus on a single and precise definition of SFM, Sabogal (2010) noted that exemplary forest management is reflected in the clarity of the objectives, conditions of the forest, and the benefits generated for its owners and society in general. Durst *et al.* (2005) identified distinct commonalities among the nominated cases in terms of good forest management practices and their implementation. The core components that contributed to exceptional performance included effective silviculture, sound ecosystem management practices, the presence of a comprehensive forest management plan that guided operations towards predefined and agreed-upon goals, tacit or explicit political support for these objectives, and a shared commitment to excellence.

OBJECTIVES OF THE REVISIT

This initiative aimed to inform forest sector stakeholders of the essential enabling conditions for SFM in the current environment and in the long term by revisiting specific cases. It identifies key environmental and economic changes and reveals how forest management objectives and approaches evolved in the last two decades in response to these changes and altered societal expectations regarding forests. The findings seek to inform and guide the development and implementation of projects undertaken in support of SFM by countries, FAO and development partners around the world.

SELECTION OF CASES FOR THE REVISIT

The three previous *In Search of Excellence* publications for Asia and the Pacific, Central Africa, and Latin America and the Caribbean were reviewed and a database of their 64 featured cases was compiled. The database includes pertinent facts on each case, including region and country, forest type, type of ownership, forest management objectives, summary of forest management activities, techniques and approaches used, scale of operation, funding and other support provided,

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social and environmental outcomes, main achievements, and areas for further development.

From the original 64 cases, 25 cases were selected for the revisit based on a review of the previous documentation, discussions with experts in each of the three regions, and internet searches to explore their status. These include 11 cases from Asia and the Pacific, 5 cases from Central Africa, and 9 cases from Latin America and the Caribbean. The 25 cases were chosen to represent the diversity in each region in types of forest ownership and management, forest and ecosystem types, management objectives and approaches, extent of forest area managed, as well as potential for learning useful lessons.

APPROACH AND METHODOLOGY

Revisits of the selected cases were conducted by regional or country experts using a systematic approach to ensure consistent and complete coverage of issues among the case studies. Elements and parameters to be assessed when revisiting the selected case studies were identified, and a preliminary desk-based revisit of one sample case was conducted to inform and further refine the design of revisits and guiding questions. The guidance was finalized with inputs from experts and regional partner organizations to ensure relevance and validity across the regions and a broad spectrum of cases.

The revisits were carried out through a combination of the following methods:

1. Desk-based research. Information was gathered from the forest owner or manager, relevant experts, published literature and internet searches. Information included environmental and social impact assessments, management plans, monitoring reports, certification audit reports, government reports, web stories, media articles, scientific literature and grey literature. Google Earth and other available geospatial databases (e.g. Global Forest Watch) were used to obtain an overview of the land cover and land use over time in and around the case study sites.
2. Online or face-to-face interviews with the forest owners or managers (current and/or past), relevant experts and key informants.
3. Field visits depending on the need (i.e. completeness of information that could be gathered remotely) and feasibility (i.e. access, cost, agreement by the forest owner or manager). Visits lasted two to three days for each site, including field observations, interviews and focus group discussions with the local stakeholders.

Guiding questions for the interviews, field visits and analyses were as follows:

1. How has the case evolved over the past two decades? Is it still considered a success and an exemplary case of SFM? Why?
2. What have been the key changes and developments since its original listing (considering all criteria listed in **Table 1** as is relevant to the case)? What contributed to these developments and what have been the impacts?
3. What factors have contributed to the deterioration or success of forest management, and what are the main lessons learned in terms of maintaining SFM?
4. What is the future outlook for the forest (e.g. considering climate change impacts, demand for products and services, markets, financial viability, political and regulatory environment, local livelihoods)?

Data collected from various sources through review of documentation, interviews, meetings and field observations were analysed and written up as a case study report for each selected forest. All case reports follow a defined template to ensure consistency in the range of information covered.

In this revisit, information was gathered on the current situation and changes that have occurred over the past two decades regarding key aspects of forest management in line with the broad SFM criteria and indicators developed globally (**Table 1**). The case study reports were reviewed and validated by the forest manager or owner, key informants and relevant experts.

Table 1. *Criteria, aspects and issues assessed in the revisit*

CRITERIA	ASPECTS/ISSUES
1. Management objectives	• Primary and secondary objectives of forest management • Multiple use as a principal objective • Factors that have driven or necessitated changes in management objectives
2. Type and condition of forest and scale of operation	• Forest area • Forest type (e.g. forest plantation, natural forest, agroforest, other planted forests) • Forest condition (e.g. structure, species composition, growing stock, health) • Changes in proportion of natural vs planted forests, as well as areas managed for production vs protection
3. Legal status and management structure	• Legal status of the forest area • Management and ownership type, organizational structure, licensing • Tenure and property rights (including any lack of clarity, disputes or overlaps)
4. Regulatory environment and government support	• Policies in support of, or hampering, sustainable forest management • Government capacity and support (e.g. extension services, law enforcement) • Permitting requirements (e.g. for harvesting, transport, concession renewal) • Requirement for forest management planning • Tariffs, fees, royalties • Mandatory certification under national or international standards • Legal requirements for environmental protection, biodiversity protection, social protection, labour conditions, among others
5. Forest management practices (including natural and planted forests, trees outside forests and non-wood forest products)	• Forest management planning and implementation • Plantation development (e.g. site preparation, planting design, species composition) • Silvicultural system and practices (e.g. regeneration, thinning, harvesting) • Post-harvest activities • Management of non-wood forest products • Management of trees outside forests (e.g. agroforests) • Reforestation and restoration methods • Nursery management • Pest and fire control methods • Monitoring (e.g. parameters, timeframe, methodologies, feedback to forest management)
6. Production and business aspects	• Forest products generated including non-wood forest products (e.g. type of product, species, volume, quality) • Non-consumptive services generated and marketed (e.g. carbon, watershed protection, ecotourism) • Processing and value addition • Business management, entrepreneurship • Markets (e.g. access, prices, legality, domestic vs international, stability, import and export restrictions) • Income from forest products and services, cost of forest management, and profitability • Financing and investment • Certification (legality, forest management, chain of custody, international and national schemes) • Measures to adapt and respond to market changes, natural disasters and other disruptions • Road and other infrastructure enabling access to forests and markets

CRITERIA	ASPECTS/ISSUES
7. Social aspects and impacts	• Human resource availability, capacity, staff turnover and retention • Number and composition of workers and employees • Participation of local stakeholders (local communities, Indigenous Peoples, government, traditional leaders, non-governmental organizations [NGOs]), including their roles in forest management and decision-making • Equitable sharing of benefits and responsibilities • Community demographics and forest dependence • Socioeconomic impacts of forest management on local communities • Tenure rights over land, resources, products and ecosystem services • Local infrastructure and social services development (e.g. roads, healthcare, schools, community centres) • Livelihood support (e.g. alternative income generation, access to microcredit and grants) • Empowerment of local communities • Use of traditional knowledge and maintenance of cultural identity • Community organization, training, awareness raising and capacity development • Conflict management
8. Environmental aspects and impacts	• Environmental impact assessment, management and monitoring • Impact of forest management activities on ecosystem services (e.g. water, soil, carbon, disaster risk reduction) and biodiversity • Role of the forest in building resilience and mitigating disaster risks
9. Challenges and threats	• Political and regulatory aspects • Tenure over land and resources • Illegal and informal harvesting and encroachment (nature and level of pressure, measures to address the causes) • Natural disasters, extreme weather events, pests and diseases, fires, invasive species • Market access, changes and fluctuations • Financial feasibility • Sustainability of forest resources
10. Opportunities	• Political and financial support for sustainable forest management, restoration • Leadership, local champions, models and demonstration sites for replication and scaling up • Sustainable use of natural resources for local livelihoods and enhancing community resilience • Markets for ecosystem services (e.g. carbon storage, water regulation, biodiversity conservation, climate resilience, recreation, ecotourism) • Product diversification and value addition • Research and education
11. Partnerships	• Types of partners and nature of collaboration • Support provided by networks and associations • Technical and financial support from private and public institutions
12. Innovation, recognition and outreach	• Innovations (e.g. technologies, partnerships) • Awards and recognitions received • Knowledge sharing, awareness raising, advocacy, exchange, outreach

To evaluate whether the previously highlighted cases continue to succeed as exemplary cases of SFM, a traffic light assessment of the key components of SFM identified in the previous *In Search of Excellence* initiative was conducted. Aspects that are well managed or show significant improvement were given a "green" rating. For those areas where performance or contributions declined slightly, "yellow" was given. Components for which the forest has declined considerably in performance were marked "red". Quantitative data were used for the evaluation where possible (e.g. volume of harvest or production, revenues, etc.), but the assessment of many of the parameters depended on a combination of qualitative data, observations, stakeholder perspectives and expert judgement.

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Components assessed are as follows:

- forest condition (structure, composition, growing stock, health, ecological processes);
- tenure and property rights;
- institutional and management frameworks;
- formal management planning (quality of planning, implementation and monitoring)
- silvicultural practices;
- ecosystem services and biodiversity;
- participation of local stakeholders;
- support to livelihoods and empowerment of local communities;
- control of illegal activities and conflict management;
- protection of social and cultural values, including the use of traditional knowledge;
- business management and financial viability;
- partnerships and collaboration; and
- research, education, innovation, outreach, awards and recognition.

As the traffic light ratings were somewhat subjective and depended to a degree on the expert judgement of each case study author, these ratings were not reported for each case but used to inform regional and global-level observations.

COORDINATION AND SYNTHESES

Regional partner organizations provided coordination support for the assessment in each region: the Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC) and the Wyss Academy for Nature at the University of Bern (for Asia and the Pacific); the Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF) (for Central Africa); and the Tropical Agricultural Research and Higher Education Center (CATIE) (for Latin America and the Caribbean). They conducted many of the case studies, supported the recruitment of case study authors, and provided technical backstopping to bring the materials together in a coherent and consistent manner. They organized regional meetings to discuss the findings, reflect on commonalities and differences, and draw key lessons learned.

Based on the collection of case studies and the regional-level findings, regional syntheses of the case study findings were developed by the partner organizations and reviewed by relevant experts. Finally, a global synthesis of all findings was compiled. The synthesis highlights enabling conditions for SFM in the current environment, identifies key changes in forest management approaches and practices over time, and reflects on factors that drove or necessitated these changes. All case studies, regional syntheses and the global synthesis are brought together in this publication.

SUMMARY OF CASES REVISITED

A summary of the 25 cases revisited, including the core management objectives and form of ownership, is presented in **Table 2** below.

Table 2. *Summary information of the 25 revisited cases*

NO	NAME OF FOREST AREA	COUNTRY	SIZE OF FOREST AREA	MANAGEMENT OBJECTIVES	OWNERSHIP AND MANAGEMENT
ASIA AND THE PACIFIC					
1.	Australian Bluegum Plantations (previously Timbercorp)	Australia	85 000 ha	Production of high-quality hardwood chips for export	A company funded by private equity
2.	Chaubas-Bhumlu community sawmill (and the four community forests)	Nepal	232.5 ha	Timber production; income and employment generation	Four community forest user groups; community sawmill management committee
3.	Diamond Raya timber concession	Indonesia	85 155 ha	Sustainable timber production	State-owned forest with concession rights awarded to a private company
4.	Huoshan County community forests	China	3 000 ha	Multiple use; forest ecosystem services	Individual forest farmers and County Forestry Bureau
5.	Imabari City Forest	Japan	2 439 ha	Multiple use with a focus on watershed protection and disaster mitigation	Imabari city
6.	Kalibo Mangroves (Bakhawan Nature Study and Eco-Park)	Philippines	220 ha	Mangrove rehabilitation, conservation and recreation	Community forest management association with tenure rights granted by the state
7.	Kampong Phluk	Cambodia	12 033 ha	Conservation of aquatic biodiversity; sustainable management and use of flooded forest resources and services for improved livelihoods; mitigation of disasters	Community Fisheries Management Committee

Table 2. *(continued)*

NO	NAME OF FOREST AREA	COUNTRY	SIZE OF FOREST AREA	MANAGEMENT OBJECTIVES	OWNERSHIP AND MANAGEMENT
8.	Lake Taupo Forest	New Zealand	33 000 ha	Sustainable land management through forestry to create economic, social and environmental wealth	Forest Trust established by the indigenous owners
9.	Nakavu Forest	Fiji	315 ha	Sustainable timber production model; collaborative research	Ministry of Fisheries and Forests on communally owned forest leased from the villagers
10.	Periyar Tiger Reserve	India	92 500 ha	Maintaining a healthy population of tigers; conserving biodiversity; strengthening ecodevelopment; enhancing protection through community-based ecotourism	State Forest and Wildlife Department
11.	Repong damar	Indonesia	29 000 ha	Preserving traditional agroforestry practices and cultural heritage; maintaining the community's economic sustainability and landownership; promoting biodiversity within the cultivated area	Local community of traditional damar farmers; community plantation forest cooperatives
CENTRAL AFRICA					
12.	Haut-Abanga sustainable forest management concession	Gabon	293 833 ha	Sustainable timber production; sustainable coexistence with local populations with respect to their social rights; collective social development actions; protection of ecologically sensitive sites and biodiversity	State-owned forest with concession rights awarded to a private company
13.	Lokoundjé-Nyong forest	Cameroon	102 699 ha	Timber production	State-owned forest with concession rights awarded to a private company
14.	Lossi Gorilla Sanctuary	the Republic of the Congo	35 000 ha	Developing rational use of natural resources for the benefit of local populations; protecting biodiversity and ecosystems; promoting tourism; developing research and environmental education; guaranteeing good governance and sustainable financing	Partnership between the government Agency for Wildlife and Protected Areas, an NGO, local community representatives, and conservation and business networks
15.	Luba Caldera Scientific Reserve	Equatorial Guinea	62 900 ha	Research, protection and integrated management of the natural resources; enhanced contribution of the reserve to the local and national economy; provision of ecological and environmental services	National Institute for Forestry Development and Management of the Protected Areas System
16.	Magara-Gashikanwa forest plantation	Burundi	60.8 ha	Production of firewood, poles and timber	Local administration and public forestry service

Table 2. *(continued)*

NO	NAME OF FOREST AREA	COUNTRY	SIZE OF FOREST AREA	MANAGEMENT OBJECTIVES	OWNERSHIP AND MANAGEMENT
LATIN AMERICA AND THE CARIBBEAN					
17.	Brisas de Copén	Honduras	4 284 ha	Industrial wood production; forest protection; community forest management	Collective society of local residents under a usufruct contract granted by the state
18.	El Choloque, Comunidad Campesina en Lambayeque	Peru	1 027 ha	Production of non-timber forest products; collection of firewood and deadwood for self-consumption; beekeeping; agroforestry	Community association under the supervision of the local administration
19.	Ejido San Diego de Tezains	Mexico	60 000 ha	Wood production; forest conservation; tourism development; local social development	Communal ownership and management
20.	Iratapuru River Sustainable Development Reserve	Brazil	806 184 ha	Collection and processing of Brazil nuts and other non-timber forest products; biodiversity conservation; socioeconomic benefits for communities	State government; management council made up of representatives from public institutions, civil society and traditional communities; mixed cooperative of producers and extractivists
21.	La Chonta	Bolivia (Plurinational State of)	90 138 ha	Timber production	Indigenous community association
22.	Manoa	Brazil	74 039 ha	Sustainable timber production; generation of carbon credits; forest conservation	Private company ownership
23.	Mapu Lahual and Lafken Mapu Indigenous Parks Network	Chile	62 000 ha	Multiple use, including production from dead wood and non-timber forest products, ecosystem conservation, and community-based ecotourism	Indigenous community association
24.	San Andrés community forest concession	Guatemala	52 940 ha	Integrated forest management for production of timber and non-wood forest products	Community association with a concession granted by the state
25.	Zambrana-Chacuey Agroforestry Producers Association, Colinas Bajas	Dominican Republic	875 ha	Industrial wood production; multiple use; biodiversity conservation; socioeconomic benefits for communities	Association of agroforestry producers

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KEY INSIGHTS FROM A GLOBAL PERSPECTIVE

Kenichi Shono, FAO, and **Unna Chokkalingam**, International Forestry Expert

Although the revisited cases varied widely in management objectives and socioeconomic context, there were common trends and lessons learned that emerged from the analyses. Much work has been done to identify enabling conditions and success factors for SFM. These include political commitment; supportive national policies; strong institutions; laws and regulations, appropriate governance; secure forest tenure and clearly defined access and use rights; availability of personnel with the capacity to perform forest management; stakeholder participation in land-use and forest management planning, monitoring and assessment; and incentives to encourage SFM; among others (Durst *et al*., 2005; ITTO, 2015). Here, we do not repeat these preconditions, which were indeed validated by the revisits, but describe current trends and responses that have contributed to the maintenance of high standards in forest management or in some cases resulted in the decline of forest resources and operations.

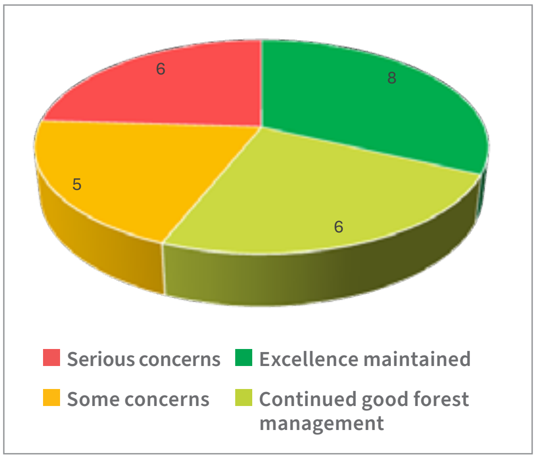
EXCELLENCE NOT EASY TO MAINTAIN, BUT THERE IS HOPE

The result of the revisits was a mix in terms of performance. Many of the revisited cases faced significant challenges (regulatory, financial, capacity, demographic, environmental, socio-cultural, etc.) and went through major changes during the past two decades. Some were able to adapt and respond to such challenges. These cases continued to thrive, exhibiting excellence in forest management across the social, economic and environmental aspects of forest management. At the other end of the spectrum, forest management collapsed due to forest managers' inability to cope with the various pressures.

The results of the traffic light assessment show that 8 of the 25 cases revisited continue to demonstrate excellence in forest management (**Figure 1**). Six cases exhibited continuation of good forest management overall. Five cases exhibited some areas of concern and decline in the quality of forest management. Significant deterioration in the quality of forest management was observed in six cases where the forests were no longer being sustainably managed.

All revisited cases were considered as excellent examples of forest management two decades ago, exhibiting promise for the future. The result of this revisit illustrates just how difficult it is to maintain high-quality forest management over the long term amid the changing social, environmental and economic conditions. The fact that more than half of the cases continue to thrive, with the forest being actively

Figure 1. *Traffic light assessment of the revisited cases*



managed in a sustainable manner, does offer hope that SFM is in fact a viable long-term proposition.

BUSINESS AND FINANCIAL MANAGEMENT AMONG THE KEY CHALLENGES

Components of SFM that declined the most in overall performance among the cases were as follows:

- business management and financial viability;
- control of illegal activities and conflict management;
- participation of local stakeholders;
- silvicultural practices; and
- tenure and property rights.

These challenges are all linked. Poor financial viability of operations may mean inadequate resources to control illegal activities and to manage conflicts. Inadequate participation of local stakeholders in forest management planning and implementation, as well as unclear tenure, are likely to result in more illegality and conflicts. Silvicultural practices also suffer when forest resources are degraded due to illegal activities or from lack of investment to ensure sustainability of harvested forest products.

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POSITIVE PROGRESS IN FOREST MANAGEMENT PLANNING AND MAINTENANCE OF ECOSYSTEM SERVICES

On the other hand, components that were assessed as progressing well and presenting less of a challenge were:

- formal forest management planning;
- ecosystem services and biodiversity;
- protection of social and cultural values, including use of traditional knowledge; and
- research, education, innovation, outreach, awards and recognition.

Forest management planning is a legal requirement in most countries, and this aspect seems to be well institutionalized. Greater awareness of forest ecosystem services, including preservation of social and cultural values, has resulted in these aspects being well managed in most cases.

CHANGE IN REGULATIONS RESULTING IN SIGNIFICANT IMPACTS, POSITIVE OR NEGATIVE

Many of the cases were affected by regulatory changes in the past two decades. Some of these regulations provided positive incentives to sustain forest management (e.g. subsidies for forest management activities, clarifying and strengthening tenure, or providing a stable investment environment). However, some changes negatively affected the forest sector, most significantly policies that favour other, more economically attractive land uses.

MORE ENVIRONMENTAL AWARENESS, LESS SUPPORT FOR PRODUCTION FORESTRY

Many of the cases highlighted greater awareness of the environmental benefits provided by forests among the public and policymakers. This has resulted in increased support for forest protection and conservation, including opportunities for ecotourism and payment for ecosystem services (e.g. for water regulation). However, in some cases, such awareness has led to less support for production forestry, as the role of well-managed forests in providing multiple values does not seem to be well understood. De-emphasis on forest production is also linked to economic and demographic changes.

IMPROVED ECONOMIC PROSPECTS FOR SUSTAINABLE FOREST MANAGEMENT THROUGH PAYMENT FOR ECOSYSTEM SERVICES

There are indications of an increase in opportunities to generate income from environmental services, including from forest carbon, water regulation, ecotourism and biodiversity conservation. Many of the cases are exploring, and some are already benefiting from, such services. Income generation from non-consumptive use of forests may improve economic prospects for SFM, helping to maintain forest land use in the face of increasing land-use pressures.

ECONOMIC DEVELOPMENT AND DEMOGRAPHIC SHIFT DRIVING CHANGES IN FOREST MANAGEMENT

In some cases, forest managers, particularly Indigenous Peoples and local communities, continued to practise forest management to help maintain cultural identity. But in other cases, the younger generation was less interested in maintaining such traditional practices in view of other economic opportunities available locally or in cities. Similarly, economic development has resulted in fewer people interested in working in primary industries. Ageing populations and urbanization have also accelerated the dissociation of rural livelihoods and cultural identity from forests. In some cases, this has resulted in natural regeneration of forests on abandoned agricultural lands and recovery of forest resources due to removal of pressure. In other cases, it has resulted in degradation of managed forests.

At the same time, these changes have increased demand for certain forest services, such as health benefits, landscape aesthetics, water regulation and climate mitigation. While livelihoods are less dependent on forests, there seem to be more opportunities for ecotourism and forest conservation due to greater awareness of these initiatives.

INTENSIFYING IMPACT OF CLIMATE CHANGE

Negative impacts of climate change, including destruction of timber resources, fires, pests and diseases, reduced productivity of non-wood forest products (NWFPs) and damage to infrastructure were noted in many cases. Compared to the previous review two decades ago, such impacts were highlighted as having a much more direct and visible effect on forest management.

INCREASING PRESSURE FROM OTHER LAND-USE SECTORS

Heavy pressures to convert forests to other land uses were prominent in some cases. Commercial agriculture was the primary driver, often resulting in deforestation of landscapes surrounding the remaining forests. The ability of forest managers to resist such pressures and maintain forest management seems uncertain in some situations where the alternative land use provides higher economic returns. National development strategies also prioritize economic crop development as opposed to forest management, the latter providing less incentive for governments in terms of tax revenues and increasing food production.

MULTIPLE USE BECOMING MORE EXPLICIT

Many of the past highlighted forests were already being managed with a variety of uses in mind. However, it was observed that multiple-use management has become more common and explicit, with multiple use being the primary management objective. In addition to forest production, many of the cases also identified environmental services, preservation of traditions and cultural values, community development, and enhanced livelihoods as key objectives of forest management. In many cases, the key impetus to continue active forest management was to preserve the non-consumptive value of forests, as opposed to focusing on timber production from purely economic motives.

PRODUCT DIVERSIFICATION AND VALUE ADDITION

Two of the common aspects of the successful cases were product diversification and value addition. Actions included increasing the number of timber species harvested to improve the financial viability of tropical forest management by increasing “value density” (Hensbergen, 2018). Diversifying the product based on market demands was also observed, including for NWFPs. Several forest managers have expanded their businesses to include wood processing in addition to forest management, enabling them to cover a wider range of the forest product value chain and capture greater economic benefits.

NATURAL FOREST CONCESSIONS – VIABILITY IN QUESTION?

Our revisit included four industrial logging concessions ranging in area from 85 000 ha to nearly 300 000 ha. All of these cases showed significant deterioration in some components of SFM. Concessions have often been criticized for their failures, although these failures are attributable more often to general poor forest governance than to the concession model itself (Hensbergen, 2018). If well managed, concessions can make sustainable use of ecosystem services as a core business, providing public goods for socioeconomic development and contributing to national economies (Tegegne *et al.*, 2019). However, examples of these successes are few and far between.

The most common and serious challenges faced by concessions were: (i) tenure and property rights; (ii) control of illegal activities and conflict management; and (iii) participation of local stakeholders. Compared to challenges faced by all cases overall, it is noticeable that business management and financial viability were not considered a key challenge for the concession, while tenure was a much more important concern.

INDUSTRIAL PLANTATION FORESTS AS EFFICIENT PROVIDERS OF TIMBER

According to the Global Forest Resources Assessment 2020 (FAO, 2020), the area of naturally regenerating forests decreased by 301 million ha between 1990 and 2020, while the area of planted forests increased by 123 million ha over the same period. While the contribution of planted forests to biodiversity conservation, water protection, local livelihoods and other ecosystem services provision can be context-specific, it is apparent that their role in global wood production will become increasingly important in the future. From the cases reviewed, financial and technical efficiency, cutting-edge technologies, genetics and tree improvement, value addition, access to markets, and marketing skills are critical in ensuring sustainability of forest plantations. It is likely that production from natural forests will continue to decline, as evidenced by the many cases that have diversified in management objectives and emphasized non-production benefits of forest management.

ACTIVE FOREST MANAGEMENT HELPING TO MAINTAIN FOREST LAND USE

Many of the cases revisited in this study represent fragmented islands of forests surrounded by deforested landscapes. Although fragmented, these remnant forests serve as refuges for wildlife and provide vital ecosystem services that enhance agricultural production around the forest area. Managed forests resist deforestation and deter illegal harvesting, sometimes even outperforming legally protected areas in protecting from encroachment.

CERTIFICATION TO DEMONSTRATE COMMITMENT TO SUSTAINABILITY

Many of the cases that had achieved forest management certification have managed to maintain certified status for over two decades. Certification has resulted in improved market access in some cases, but not many have mentioned price premium as a key benefit of forest certification. The most important benefit of certification seems to be in reinforcing the process of periodic review and continuous improvement in forest management, demonstrating commitment to SFM and serving as a source of pride in striving for best standards in forest management.

SECURE TENURE – A PREREQUISITE BUT NOT A GUARANTEE

Secure tenure and clearly defined access and use rights are necessary conditions for SFM. However, tenure is not a silver bullet to enable SFM, given the complex interplay between environmental, socioeconomic and cultural contexts that influence forest and land-use decisions by individuals, communities and regulatory authorities. In some cases, economic pressures have prompted local communities with tenure to convert forests to other land uses or to exploit forest resources without a long-term vision due to inconsistent government policies, lack of enforcement, future uncertainties and other factors.

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REGIONAL SYNTHESIS

ASIA-PACIFIC

Sophie Rose Lewis, Southeast Asia Forest Governance Expert

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OVERVIEW OF THE SELECTED CASES

This synthesis explores 11 initiatives spanning ten countries: Australia, Cambodia, China, Fiji, India, Indonesia, Japan, Nepal, New Zealand and the Philippines. These cases vary in terms of objectives, scale and management arrangements, which this section outlines alongside the successes and challenges of each initiative.

PRIVATE SECTOR AS THE LEAD MANAGING ENTITY

The Forest Stewardship Council (FSC)-certified Diamond Raya Timber concession is one of Indonesia's few remaining natural forest concessions. Balancing environmental protection and social considerations is crucial to the Diamond Raya Timber concession. Short-term economic advantages of other land uses compared to natural forest harvesting hinders efforts to advance and optimize partnerships with local actors to protect the forest from encroachment. There is a potential legal avenue for diversification into ecotourism, carbon trading and bioenergy. However, the absence of clear operational guidelines for this avenue and viable models, particularly in peatland environments, poses a challenge.

In 2009 in Australia, regulatory changes led to the collapse of large managed investment schemes, including Timbercorp. Global Forest Partners, through their new entity, Australian Bluegum Plantations, seized the opportunity to acquire Timbercorp's blue gum eucalyptus plantations. Today, the company is the world's largest exporter of hardwood chips, managing over 85 000 ha. Australian Bluegum Plantations has integrated environmental projects into its management portfolio to demonstrate its commitment to environmental responsibility and to maintain a "social licence to operate".

INDIVIDUAL FARMERS AS FOREST OWNERS

Individual forest farmers are the primary forest landowners in the initiative from Huoshan County, China. Tenure reforms between 2007 and 2013 separated forest landownership, contracting and management rights. This separation enabled forest farmers to transfer management rights to companies or other villagers while retaining landownership and generating income through lease arrangements. A number of factors contribute to a diversifying forest economy and landscape. They include land tenure regulations; compensation payments made for environmental stewardship of public welfare forests; and policies that promote mixed plantations, planting of woody oil trees and organic product certification.

GOVERNMENT ADMINISTRATIONS AS PRIMARY MANAGING ACTORS

Nakavu Forest in Fiji is a lowland indigenous rainforest owned by members of the Yavusa Nabukebuke indigenous tribe who reside near Nakavu Village. In 1991, Nakavu villagers leased a 315-ha forest site to the Forestry Department for 50 years to conduct research on the impacts of varying logging intensities on the residual forest and its subsequent growth and development. There is now expanding recognition of the benefits of SFM on other features, such as biodiversity, water quality and carbon. Research results demonstrate that lower-intensity timber harvesting retains and replaces carbon more rapidly, providing valuable insights for potential benefits in future carbon trading.

The Kerala Forest Department oversees the Periyar Tiger Reserve in India, emphasizing tiger conservation, protection of their habitat and community livelihood development. Commitment to conservation led to the steady increase in tiger numbers, from 2967 in 2018 to 3167 in 2022. Additionally, there was a positive trend in vegetation and a decrease in forest fragmentation from 2000 to 2020. An estimated 20 000 to 30 000 people are substantially dependent on the reserve for their livelihood, and the Periyar Tiger Reserve places significant importance on participatory community livelihood development as a means to concurrently achieve successful conservation and socioeconomic outcomes.

In Imabari City, Japan, the 2500-ha forest underwent a transfer from a local forest cooperative to the municipal government in 2005. This transfer resulted from a merger of towns and villages into a city, causing the cooperative to lose legal standing. Currently, Imabari City owns 2 439 ha of forest, of which 484 ha are under a profit-sharing agreement with private landowners and other entities. Despite the change in ownership, the management objectives of the municipal government align with those of the former cooperative, focusing on protecting watersheds and reducing the risk of water-related disasters. The government and citizens' commitment to forest management for watershed protection continues to yield benefits for local agriculture, industries and residents.

LOCAL COMMUNITIES AS THE PRIMARY MANAGERS

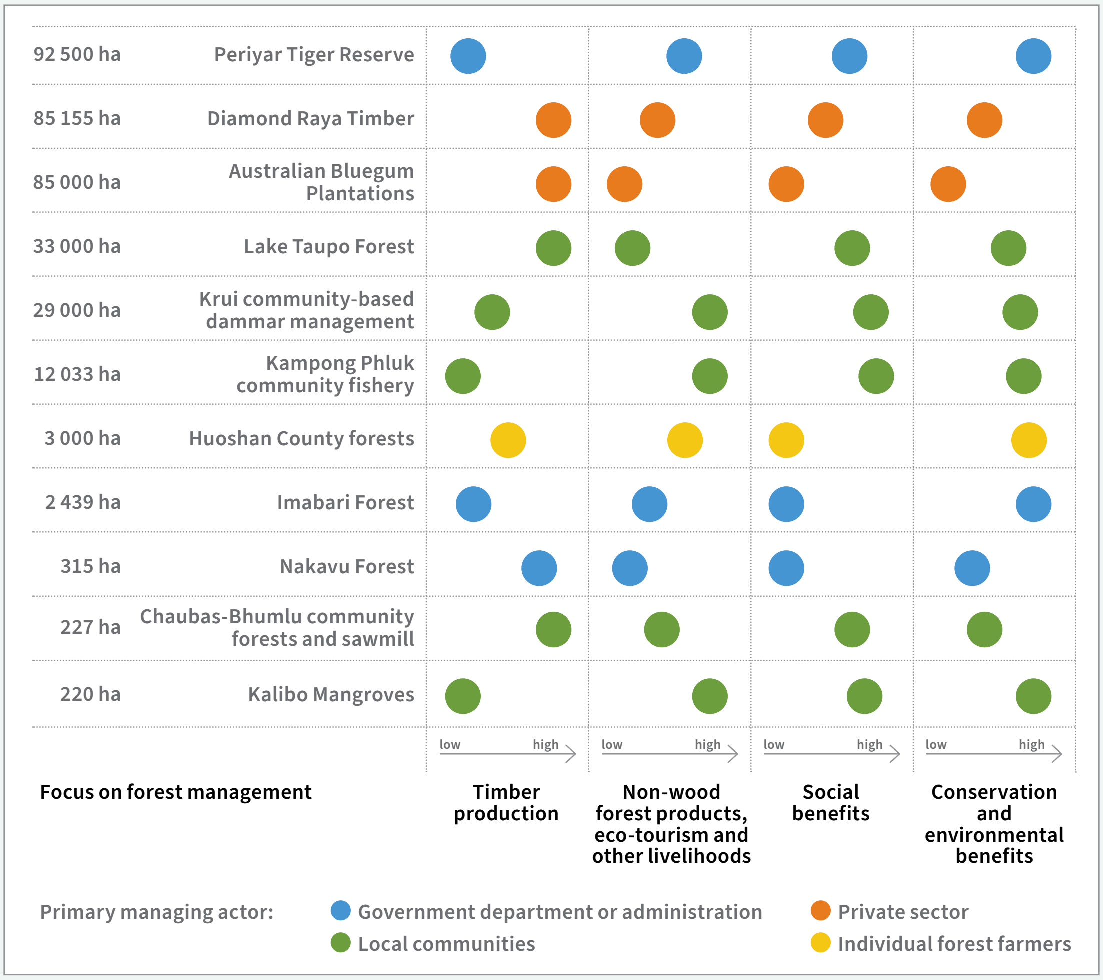
In New Zealand, the Māori tribal group developed strong relationships with the government, which invested in developing their customary land into a production forest, supporting local economic and infrastructure development. This effective high-trust multistakeholder cooperation enabled the Lake Taupo Forest Trust, the representative body of the Māori landowners, to gain full ownership over a thriving forest and forest economy within their customary lands while protecting their traditions and developing community networks and capacity.

In the Kalibo Mangroves, Philippines, and Kampong Phluk Community Fisheries, Cambodia, a strong commitment to conservation led communities to form local patrol groups that are now crucial in protecting mangroves and flooded forests. Additionally, in 2017, Kampong Phluk won the first Best Tourism Resort award from the Cambodian Ministry of Tourism. In 2023, the Kalibo Save the Mangroves Association received an award from the Philippines Department of Tourism for the Bakhawan Eco-Park, established around Kalibo Mangrove Forest.

In the case of Chaubas-Bhumlu, Nepal, local people manage community forests, four of which are linked to a community sawmill. Unfortunately, the mill faced operational challenges from 2007 to 2012 due to the gradual withdrawal of external donor support and regulatory changes that prevented the sawmill from competitively bidding on timber from its community forest. However, the mill reopened in 2018 and operated through 2022 under a model of the community leasing the sawmill to private operators for a fee. There are hopes of revitalizing the mill by creating and formalizing a clear business plan for a public–private partnership model based on the 2018–2022 experience. Beyond the fate of the mill, other viable opportunities include SFM and sale of timber from the community forests to outside markets with favourable rates.

Finally, in Indonesia, the Krui community-based damar agroforest plays a vital role in maintaining the Krui community's customs and traditional land-use practices and in supporting rich forest biodiversity. Unfortunately, inconsistent regulations, limited external facilitation and support, economic pressures, and encroachment from oil palm plantations contributed to the diminishment of the Krui community's customary agroforest and practices. This led to a reduction of the forest from 29 000 ha in 2011 to 6 510 ha in 2022, highlighting the challenges communities face in balancing economic, environmental and social considerations in forest management.

Figure 1. *Overview of Asia-Pacific case studies, highlighting scale, focus of forest management and primary managing actors*



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TRENDS AND KEY CHANGES

LOCAL FOREST DEPENDENCY

In many countries, local communities remain largely dependent on forests for income and resources. In the Kampong Phluk community fisheries in Cambodia, the flooded forests, a crucial spawning ground for fish, are vital for most of the local population, whose main occupation is fishing. In Indonesia, the Krui community-based damar agroforest is essential for the livelihood of 80 percent of the local population. In India, between 20 000 and 30 000 people near the Periyar Tiger Reserve depend significantly on the reserve for their livelihood, including six Indigenous Peoples groups of 5 000 people who have distinct ecocultural associations with these forests. In the Philippines, during the COVID-19 pandemic, the Kalibo mangrove forest became a vital safety net for local people. Lastly, Australian Bluegum Plantations in Australia offers local employment opportunities, though variable across the plantation life cycle.

However, in some cases, demographic and economic shifts have altered forest dependency. Since 2005, Chaubas-Bhumlu communities have witnessed a 50 percent reduction in forest dependency, due to substantial outmigration of youth for employment and education, and wealthier families (22 percent) having dual residences in the village and urban areas, while poorer families still rely on forests for fuel, forage and timber. In Imabari City and Huoshan County, there is a shortage of skilled labour in local forest industries. This is largely due to an ageing population that cannot actively participate in forest management and the younger generation who are less interested in forestry work, often opting for alternative local work or migrating to urban areas and abroad for better wages and opportunities. In Imabari City, there is now little direct use of the forest resources by local people; nevertheless, most local people still recognize the immense value of the forest for watershed protection, health benefits and landscape aesthetics.

CHALLENGES OF FOREST ENCROACHMENT AND ILLEGAL ACTIVITIES

Challenges related to forest encroachment and illegal activities are persistent in some of the revisited cases. In Kampong Phluk community fisheries, issues similar to those reported in 2005 were identified in 2023: a decline in fish stock due to the widespread use of illegal fishing gear and cutting of large trees in the flooded forests by people outside the community. Similarly, in Periyar Tiger Reserve, wildlife poaching, illegal logging, marijuana cultivation and illegal collection of NWFPs were recognized in 2005 and persisted in 2023. Diamond Raya Timber also continues to be under threat from interests of the local government and individuals to convert the area to oil palm.

FLUCTUATING PRICES AND RISING COSTS

Fluctuating prices of primary forest products have impacted SFM initiatives since 2005. For instance, in Huoshan County, among rising labour costs, the once primary economic products of forest farmers – Chinese fir, chestnuts and bamboo – have suffered from stagnating and low prices or oversaturated markets since 2005. Diamond Raya Timber concession struggles with costly plywood production from natural forests, challenging its sustainability.

In contrast, the Australian and New Zealand cases that feature large plantation forests for woodchip and timber production, respectively, show different trends. In Australia, increased demand in Asia contributes to rising woodchip prices (Brann & Hogan, 2019; Forest & Wood Products Australia, 2022). New Zealand's *Pinus radiata* prices have risen steadily from 2013 to 2023 (Ministry for Primary Industries, 2023a), and export prices remain stable (Ministry for Primary Industries, 2023b).

CLIMATE CHANGE IMPACTS, CARBON SEQUESTRATION AND ECOSYSTEM SERVICES

Awareness of potential impacts of climate change on forests and policies to enhance forest carbon storage have become more prominent since 2005. The Lake Taupo case indicates the effects of intensified weather events that forests and forest managers are contending with, including cyclones and heavy rainfall. Related to climate change, the China, Australia and Cambodia cases noted an increasing awareness that effective fire management is crucial for long-term sustainability, with increasing efforts to ensure effective forest fire monitoring and management plans and procedures.

In line with the 2015 Paris Agreement, several countries have started implementing policies to manage forests for carbon – one example is the national carbon trading systems (e.g. Japan's J-Credit and China's Certified Emission Reduction schemes). Assessments of carbon sequestration potential have been carried out in the Kalibo, Diamond Raya, Nakavu and Periyar cases.

The importance of forests in maintaining ecosystem services, including for climate change adaptation, is becoming increasingly recognized. In Indonesia, a new regulation issued in 2021 allows forest concessions to include businesses that provide environmental services. However, clear regulations for operationalizing the services are still pending. China has instituted policies that provide economic compensation to land managers for enhancing forest ecosystem services. In 2018, Japan introduced the Forest Environment Tax to fund forest management activities. In the Philippines, the Kalibo Municipal Government includes mangrove reforestation in its Disaster Risk Reduction and Management Plan and Local Climate Change Adaptation Plan, recognizing the vital protection that mangroves provide against storm surges and strong winds during typhoons. The Nakavu Forest is less than 50 km from the source of the well-known brand Fiji Water. However, the benefits that the forest provides in ensuring a supply of clean water are not easily quantifiable, leaving the Forest Department and Nakavu villagers without the means to derive economic benefits from the ecosystem services provided to Fiji Water.

RESPONSES TO THE CHANGES

INCENTIVES AND GOVERNMENT PROGRAMMES TO SUPPORT FORESTRY

Governments at local and national levels have taken steps to adjust to changing demographics and shifting timber demand. A Nepalese municipality where the Chaubas-Bhumlu community is located implemented a local regulation to boost the forest economy by promoting the procurement of locally sourced and manufactured furniture for public institutions. Imabari Forest benefits from a variety of government subsidies for forest management activities, which are provided in an effort to enhance ecosystem services provided by the country's forests and to promote the use of domestic timber. In Huoshan, local forestry authorities promote forest and forest land transfer from individual farmers to forestry operators to expand the scale of forest management and make forest management more profitable.

DIVERSIFICATION OF THE FOREST-BASED ECONOMY AND FOREST MANAGEMENT

To increase efficiency, resilience and thus sustainability, diversification of the forest-based economy and management practices are observed or explored in seven of the eleven cases. For example, Lake Taupo Forest Trust acquired the private company New Zealand Forest Managers to conduct forest management in Lake Taupo Forest and now has complete ownership over forest management operations and investments. Likewise, vertical integration through landownership (instead of leasing), plantation establishment, tending, harvesting and ownership of port facilities improved Australian Bluegum Plantations' efficiency.

Lake Taupo Forest Trust has adopted a policy of diversifying into other opportunities besides forestry and aims to hold 30 percent of non-forestry assets within ten years. Similarly, in Huoshan County, while timber production still holds importance in some parts of the county, forest management objectives have diversified to include environmental protection, climate change mitigation and adaptation, production of NWFPs and ecotourism. Likewise, in Nakavu Forest, the Forest Department is exploring carbon-related opportunities. Ecotourism has become a major income source in Kalibo and Kampong Phluk.

ENHANCED PARTNERSHIPS

Most of the revisited cases strive to foster multi-stakeholder partnerships for more effective forest management and to adapt to ongoing and changing challenges. In the case of community–private partnerships, the Chaubas-Bhumlu community sawmill, which closed in 2006, reopened from 2018 to 2022 through a community–private partnership, leasing it to private operators. Kampong Phluk community fisheries partners with private firms and tour operators, engaging in provincial and national ecotourism networks to boost their ecotourism business. The Kalibo association collaborates with a corporate social responsibility programme of a power distribution company, which also buys mangrove propagules from community nurseries.

In Imabari City, government-private sector partnerships have strengthened forest management. Since 2007, private sector companies have adopted 206 ha of forest, funding forest management activities in exchange for using the forest in corporate public relations campaigns and company outings.

Enhanced partnerships between local people, the government and the private sector are recognized as crucial to addressing forest encroachment and other environmental threats. Local governments associated with Kalibo Mangroves and Kampong Phluk community fisheries consider local patrol groups to be vital to forest protection efforts. Periyar Tiger Reserve collaborates with local groups that have formerly engaged in illegal activities, transforming their livelihoods through legal pursuits such as ecotourism. Diamond Raya Timber is seeking viable models of collaborating with local communities to manage conflicts, address livelihood issues, and combat forest encroachment and illegal activities.

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ENABLING CONDITIONS

EFFECTIVE, SUPPORTIVE AND CONSISTENT LAND TENURE AND REGULATIONS

Securing tenure is vital for the long-term stability of forest management. Australian Bluegum Plantations, for instance, gained greater autonomy by shifting land tenure from leasehold to freehold, increasing stability for its business and customers. Similarly, in Nakavu Forest, stable land tenure and consistent regulations help maintain the SFM research site.

Moreover, initiatives such as Lake Taupo Forest, Kampong Phluk community fisheries and Krui community-based damar management demonstrate that land and resource rights aligned with traditional practices help communities preserve cultural values. However, enforcement is critical.

Alongside secure land tenure arrangements, supportive and consistent regulations are crucial for SFM. For instance, in Huoshan County, flexible tenure arrangements and regulations aligned with fluctuating markets and demographic changes enable forest farmers to adapt by leasing land to private companies and diversifying the forest economy and landscape. However, inconsistent policies and regulations can impede SFM. For example, the People Forest Plantation policy, introduced by the Indonesian government in 2008, supported community groups to form cooperatives and manage commercial plantations. However, this policy led to the establishment of commercial plantations over an estimated 30 percent of the Krui community's land, altering the community's traditional damar agroforestry system.

TRUST AND INSTITUTIONALIZED COLLABORATION AMONG ACTOR GROUPS

Institutionalized collaboration among actor groups yields numerous benefits. In the Periyar Tiger Reserve, staff members work diligently with local communities to help them develop their livelihoods. This partnership is strengthened through regulations that grant forest people living near the reserve rights over forest land and resources in the buffer area. Similarly, Kampong Phluk community fisheries and the local government benefit from the Community Fisheries Management Sub-Decree (2005), which clearly defines partnerships and roles in community fisheries management. Consistent long-term collaboration between the provincial office of the Department of Environment and Natural Resources and the Kalibo association has played a crucial role in managing the Kalibo mangrove forest. A longstanding partnership between the Fiji Forest Department and successive GIZ projects has helped maintain Nakavu as a long-term research site.

Regarding private sector collaboration, Imabari City partners with private companies that contribute half of the city's forest management budget. Diamond Raya Timber, in collaboration with the Indonesian government, is attempting to build social forestry partnerships with local communities to counter widespread forest encroachment and conversion to alternative land use.

However, even if partnerships are institutionalized, there can be detrimental effects when trust breaks down. In Chaubas-Bhumlu, a breakdown of trust between the Community Forest User Group members, the District Forest Office and the Community Forest User Group Executive Committee halted silviculture activities within the community forests, with negative economic and environmental impacts.

TRANSPARENT AND EFFECTIVE ORGANIZATIONAL MANAGEMENT STRUCTURES

Well-defined organizational management with clear roles supports and strengthens SFM. The Kalibo association follows a well-defined rotation-based election process for selecting its leaders. This approach has resulted in more collaboration and has fostered local trust in the committee. Conversely, the Chaubas-Bhumlu Communities Executive Committee tends to fill leadership positions with local elites who live in urban areas and only occasionally visit the village. This approach has resulted in a breakdown of support and trust and a significant decrease in Community Forest User Group members. In Periyar Tiger Reserve, the management structure is robust and transparent; however, inadequate interstate coordination and frequent transfers of frontline staff present challenges.

Sustainable forest management successes can be attributed to strong leadership and clear organizational goals. For example, Diamond Raya Timber concession takes pride in being the first FSC-certified concession in the country, and its commitment to preserving the peat-swamp forest and its biodiversity has played a significant role in maintaining forest management among ongoing economic challenges and land-use pressures while other natural forest concessions across Indonesia are closing. Similarly, the Kalibo association's "plant, plant, plant" goal for Kalibo mangroves has increased stakeholder buy-in and support.

Lake Taupo Forest Trust and Kampong Pluck community fisheries continue to thrive, bolstered by strong leaders and shared cultures and traditions that build strong community bonds, making it easier to adapt to changing circumstances. However, the economic pressures that resulted in the reduction and degradation of the Krui community-based damar agroforest demonstrate that even robust community bonds and tenure may be insufficient to withstand challenges if such traditional forest management practices are not financially viable.

SUSTAINED INVESTMENTS

Start-up and sustained investments play a critical role in the sustainability of forest management. For example, Timbercorp's initial investment in eucalyptus plantation development and technological innovation reduced Australian Bluegum Plantations' initial input costs and risks, increasing its chances of success. In Kalibo Mangroves, the Australian Agency for International Development and the Philippines-Australia Community Assistance Program granted USD 600 000 to develop an ecotourism site. Kampong Phluk community fisheries has received continuous funding from various sources since 1999, which has supported many aspects of community fisheries management and ecotourism development. In India, the government provides financial and technical support to the Periyar Tiger Reserve for conservation, habitat management, research, community outreach and education. In Imabari, the forest environment transfer taxes collected annually by the municipality can be used for various forestry activities, training and awareness raising.

Infrastructure development is also a vital aspect of SFM that requires continued investment. For instance, in Fiji, in 2015, a major storm destroyed the road bridge that provides access to Nakavu Forest, putting an end to timber-harvesting activities. In Huoshan County, the local government's infrastructure investment reduced transportation costs and increased local people's income from forestry and agriculture. However, as widely recognized and demonstrated in the Diamond Raya Timber case, developing access roads into natural forests can contribute to deforestation and forest degradation.

Investments in technological innovation can improve efficiency and increase economic advantages. For example, Lake Taupo Forest Trust invested in several techniques to enhance the productivity of its timber plantation, including mechanized harvesting, genetically improved tree stocks, improvements to chemical products used, digital technology for mapping and planning (e.g. lidar), and predator and pest control. Similarly, Australian Bluegum Plantations' successes can be partially attributed to the previous owner's initial investment in technological efficiency and the company's continued investment in genetic improvements of their eucalyptus planting stock. Investments in technological innovation can also increase efficiency and effectiveness for conservation management. Recent investments in smartphone applications have improved the conservation of tigers and snakes in the Periyar Tiger Reserve.

Conversely, the Diamond Raya Timber concession has not been able to improve technological efficiency. This is primarily due to high operating costs in natural forests and the additional difficulties associated with functioning in a peat-swamp environment. The concession's inability to generate sufficient profit reduces partnership opportunities with local actors and the ability to compete effectively against alternative land uses.

Investing in improved human capacity is also crucial. Lake Taupo Forest Trust benefits from a compulsory New Zealand-wide levy on all logs produced, which is used for research, training and education, fire management, market development, and biosecurity protection on commercial forest estates. In Kalibo Mangroves, organizational management and training were among the top three community fund expenses from 2015 to 2023, contributing to stability and demonstrating the importance placed on developing knowledgeable and skilled leaders. In contrast, the Chaubas-Bhumlu community sawmill initiative has had little internal investment or external financial support to improve the executive committee's fiscal management or organizational capacity, which contributed to the mismanagement of sawmill profits and the breakdown of trust among various actor groups. Similarly, the Krui community has received limited external facilitation and support, limiting its capacity to adapt and respond to inconsistent regulations, forest encroachment and economic pressures.

EFFECTIVE AND TRANSPARENT BENEFIT-SHARING MECHANISMS

Related to sustained investments, effective and transparent benefit-sharing mechanisms can ensure that profits are reinvested to increase economic viability, ensure accountability and reduce conflict. In the Periyar Tiger Reserve, the Eco-development Committees have a clear revenue distribution procedure. Seventy percent of the earnings from ecotourism go to a common fund used for staff salaries, 10 percent go to a welfare fund for community loans, and 20 percent are used for operational expenses. In another case, Lake Taupo Forest Trust reinvests a portion of total harvest revenue as grants, which has amounted to NZD 100 million (USD 60 million) to date. These grants are given to the individual forest landowners and used for various forest management purposes. Conversely, the Chaubas-Bhumlu community sawmill lacks transparency and effective management over the utilization of sawmill profits. There was a misuse of funds, benefiting elites, and little investment in income-generating activities as per the guidelines, resulting in mistrust between community members and the executive committee.

INNOVATIVE LOCAL PRACTICES

In addition to the technological innovation discussed under “Sustained investments”, developing simple and innovative local practices can help in adapting to ongoing challenges. For instance, when the Kalibo association found that spraying chilli was ineffective in addressing a moth larvae infestation in Kalibo Mangroves, it paid locals to remove the larvae manually, solving the problem while generating local income. In another case, the Kampong Phluk community fisheries improved its waste management practices to reduce plastic and other forms of waste from upstream sources. Kampong Phluk is now known for its awareness-raising on waste management, inspiring other communities to visit and learn from them.

Innovative practices may require additional government and regulatory support. In the Krui community-based damar agroforest, it has been proposed that a village enterprise be established to buy damar resin from local producers at a standardized price to improve the economic viability of damar forest management. However, this approach will require strong support from the local and provincial governments to enact damar resin price controls and regulations.

FUTURE OUTLOOK OF SUSTAINABLE FOREST MANAGEMENT

As the crucial role of forests in delivering sustainable products and ecosystem services gains increased recognition, forest-based economies and landscapes are set to diversify further. Integrating the various management objectives described above may lead to expanded collaboration among governments, local communities and private sector entities. These collaborations could see Indigenous Peoples and local communities playing an increasingly integrated and prominent role in forest management and conservation through activities such as patrolling for illegal activities, fire management, ecotourism and other aspects of economic and landscape management. Alternatively, increasing demands on the forest landscape and demographic changes may prompt government agencies to seek alternative models for smallholder forests where local people retain forest landownership, albeit with less direct involvement, while contracting management to companies or government agencies. However, SFM initiatives without supportive tenure and regulatory arrangements, sufficient investments, appropriate local partnerships and required capacity may encounter increasing difficulty in sustaining good forest management. This may be especially true

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amid growing economic and land-use pressures, as well as changing demographics and cultural values.

In the years ahead, there is a strong likelihood that timber production will shift towards intensively managed planted forests, on both small and large scales. Forest managers may simultaneously have to diversify investments, products and service offerings to remain viable and meet multiple objectives. Companies and smallholders investing in or benefiting from infrastructure development, increased human capacity and advanced technologies may play a prominent role in this forest management transformation. Conversely, natural forest concessions and smallholders, lacking technical efficiency and economic advantages in timber production, may redirect their focus away from timber production. Instead, they may consider diversifying their income through carbon and biodiversity credits, as well as ecotourism opportunities. Moreover, in the era of social media, private companies are becoming more conscious of the imperative to maintain an environmentally and socially responsible image and practice. This heightened awareness may drive these companies to incorporate additional environmental and social projects into their management portfolios.

Finally, drawing on the enabling conditions and lessons learned from the 11 SFM initiatives may help pave the way for continued and enhanced SFM across the Asia-Pacific in the coming decades. One key lesson is strengthening land tenure arrangements and regulatory frameworks to align with and enable adaptability to the changing economic, social and environmental requirements of SFM. This involves minimizing regulatory contradictions that could undermine sustainable management objectives. Another lesson is fostering trust and cooperation among diverse actor groups and providing clear institutional frameworks and organizational structures that facilitate effective management and multistakeholder collaboration and benefits. In addition, sustained, equitable and efficiently distributed investments, along with technological and human capacity development, will be instrumental in ensuring the future adaptability and success of forest management. And most importantly, forest managers will need to diversify and adapt to available opportunities to remain viable and deliver the multiple production, environmental and social goals currently being expected of forests and forest landscapes.

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ASIA-PACIFIC

AUSTRALIAN BLUEGUM PLANTATIONS: THERE IS MORE TO EXCELLENCE IN FORESTRY THAN JUST TREES

Don Hammond, Hammond Resource Management Ltd.

NAME OF FOREST	**Australian Bluegum Plantations (previously Timbercorp Bluegum Tree Farms)**
LOCATION	**States of Victoria, South Australia and Western Australia, Australia**
AREA (ha)	**85 000**
MANAGING ENTITY	**Australian Bluegum Plantations**
MANAGEMENT OBJECTIVES	**Production of high-quality hardwood chips for export**
FOREST TYPE	**Forest plantation of *Eucalyptus globulus***

1. INTRODUCTION

The 2005 edition of the publication *In Search of Excellence* featured a case study on Timbercorp, a large commercial forest grower in Australia with over 70 000 ha of blue gum plantations of *Eucalyptus globulus* Labill.

In 1998, the Australian Government introduced “managed investment schemes”, which allowed companies to raise capital from the public for a wide range of investments. Popular among these schemes were blue gum, almonds, olives, avocados and a range of other primary sector crops.

For many investors, a key attraction of the investments was their tax deductibility against other income, meaning that only a proportion of the funds invested came from the investor; the balance would have otherwise been paid to the government as tax. This made the schemes attractive to high-net-worth individuals and was a key selling point for the marketing of these investments.

These primary sector investments expanded rapidly until 2009, when the regulations were changed, resulting in the collapse of several large management-investment-scheme companies, including Timbercorp, in April 2009. At that time, Timbercorp assets had a value of around Australian dollar (AUD) 750 million (USD 530 million). There were over 18 000 investors in Timbercorp, though not all in blue gum plantations; some were invested in other options like almonds and avocados.

Because of the legislative change, many investors lost most of their investment. However, this did not directly impact the forest, which remained largely in good condition; it created a financial issue. Hence, the title of this case study is “There is more to excellence in forestry than just trees”. The ability to manage not only the forest but also the business behind the forest is critical to achieving overall success.

When the *In Search of Excellence* feature was written, Timbercorp was the largest agribusiness investment company in Australia, having grown from 1 000 ha in 1991 to over 70 000 ha in 2005. Growth continued beyond that until the company was liquidated in 2009, at which time it had almost 100 000 ha of blue gum forests.

The collapse of Timbercorp highlights a problem common to many rapidly expanding businesses: that of cash flow. The working capital needed to support a business of this scale is substantial, with staff costs, land rentals, operations and management costs all having to be met month by month. Meanwhile, actual income from the forest may not be realized for a decade or more, when harvesting can begin at scale. In the interim, most of the company's income was coming in from new investors, which resulted in the company continuing to expand to meet its obligations to investors.

Following the liquidation of Timbercorp, a large proportion of the forest assets was purchased by Global Forest Partners for AUD 345 million (USD 245 million) through their new entity, Australian Bluegum Plantations (ABP). Ironically, Timbercorp's collapse may have facilitated the success of the new owners. The purchase price was around half the cost of establishing the forests. Moreover, the projects had already been de-risked: establishment failures, for example, were already known, and significant learning and innovation had already taken place. The timeline for generating income from harvests was also shortened. The incoming owner benefited from the ability to budget for what were now well-understood costs associated with maintaining and managing the forest. The new owners did not have a large group of investors to inform and manage – they were a private business. Importantly, the new owners had ready capital, unlike the original entrepreneurs who had to raise external capital to fund Timbercorp's operations.

As a result of these changes, it is not possible to make direct comparisons between Timbercorp in 2005 and the forests and owning entity that exist today. Furthermore, since ABP is funded by private equity, the information publicly available is limited. Recognizing these limitations, this report considers the changes to the forests, the reasons for Timbercorp's collapse and lessons that can be learned.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The key management objective was to produce hardwood chips for export to Japanese customers. This objective continues to the present day under new ownership, and now with exports to both Japan and China. As the world tries to move away from oil-based options, wood fibre has become more sought after. From this perspective, the vision of Timbercorp remains and has been expanded.

Another key objective for Timbercorp was to adopt a financial model of minimizing tax liability, for both investors and the business itself, by providing a suitable avenue for investors which could generate profit for the owners. These objectives do not relate to how the forest is grown and managed.

In the case of commercial greenfield forest investments such as Timbercorp, the innovator is often either a forester or a businessperson, but rarely both. The challenge is ensuring that both dimensions are adequately addressed during the establishment of the entity. Timbercorp addressed this by bringing in forestry expertise to complement its business acumen. When a new owner acquires a business – as was the case with the purchase of Timbercorp's assets by Global Forest Partners – the new owners typically bring their own business and forestry expertise to support the existing management team.

2.2. Type and condition of the forest and scale of operation

Timbercorp grew rapidly from humble beginnings until its collapse. Following its purchase by ABP, the estate has continued to expand in size and has evolved into a fully integrated business. Australian Bluegum Plantations now manages the supply chain from land acquisition and plantation establishment to harvest, transport, logistics and port activity.

Australian Bluegum Plantations currently manages 85 000 ha of blue gum plantations across three states in Australia. The Albany area of Western

Australia supports 31 000 ha while a further 54 000 are in the "Green Triangle" in Victoria and South Australia. The forests in the Green Triangle are separated by several thousand kilometres from those in Western Australia.

A forest asset of this scale requires robust systems for data management, mapping and routine management functions, especially when spread over such a large area. Forest health and genetic improvement are also important parts of management in order to produce significant volumes.

2.3. Legal status and management structure

Unlike Timbercorp, which was acting as a managed investment scheme, ABP is a company funded by private equity. It has all the normal commercial requirements to comply with Australian company law.

The management structure is designed to ensure a secure, successful business that meets or exceeds its clients' needs and supports the investor's objective of "excess risk adjusted returns".

2.4. Regulatory environment and government support

Significant changes in the regulatory regime in Australia removed many of the incentives that had made investments like Timbercorp attractive to high-net-worth individuals (e.g. the loss of tax deductibility). As a result, cash flow into the business dried up, ultimately rendering it unsustainable.

Australia has a number of support mechanisms available to encourage tree planting (such as grants) or to discourage forest land from being converted to other land use.

Recently, the value of trees in sequestering carbon has been recognized and promoted through a range of mechanisms in Australia. Australian Bluegum Plantations leverages these opportunities where applicable. A key advantage of schemes that create value from carbon is that they usually allow for early cash returns, which help offset the significant cash outlays required for forest establishment and markedly improve the net returns from forestry investments.

In addition, the government's support for privately owned forests in Australia includes activities such as research, training and market development.

2.5. Forest management practices

The regime aims for a low-cost and low-intervention model to produce uniform, high-quality blue gum woodchips at the lowest possible cost.

For ABP, the normal regime is to plant 1 100 stems per hectare with suitable weed control until the trees are established. Considerable effort is being made to improve the genetics of planted trees, promoting faster growth and enhancing traits that could increase the value of the chips produced.

No thinning or pruning is conducted, and harvesting occurs at the age of 10 to 15 years, with a target harvest age of 12 years. Actual harvest age may vary depending upon growth rates, the cost of holding the land (whether freehold or possibly higher-cost leasehold), the availability of logistics (harvesting, transport and shipping), and market demand and prices at the time.

2.6. Production and business aspects

Purchasing land and establishing a forest requires considerable up-front capital, as well as ongoing cash flow until harvesting begins. For this reason, opportunities for small investors to pool capital and invest in forestry and agriculture have emerged over the past few decades.

Given the nature of these projects, competent and independent oversight (often provided by a government agency) are essential to protect investors and instil confidence in the sector. Such oversight ensures proper and transparent management of funds. Timbercorp was one of these "schemes" that invested in forestry, emerging as an opportunity for investors to gain tax advantages while also attaining a return on their investment.

Timbercorp had its first harvest of blue gum trees in 2003, which was a milestone for the company. As noted at the time, investors had waited a long time for this harvest and the corresponding return on their capital investment. However, at the time of liquidation, the majority of the forests were still several years away from harvest.

Under the new ownership of ABP, the planned management and subsequent harvest have continued, establishing a significant presence in the industry. Today, Australian Bluegum Plantations is one of the largest exporters of hardwood chips in the world, exporting over 3 million tonnes of blue gum chips annually, along with a smaller volume of softwood chips. The company employs over 300 people, including both staff and contractors, and has achieved considerable vertical integration. This integration enhances operational efficiency through land ownership (instead of leasing) and throughout plantation establishment, tending and harvesting processes.

Australian Bluegum Plantations also purchased port facilities, thus allowing it to have greater control over the entire supply chain. This has resulted in an improved ability to meet customers' needs – delivery in full, on time, and in spec. A recent investment of AUD 22 million (USD 15.5 million) in the Portland Chip Terminal is further evidence of ABP's willingness to invest and innovate in the supply chain.

2.7. Social aspects and impacts

The transition from rural to urban living has significantly altered the relationship between societies and their surrounding ecosystems, particularly forests. Historically, the clearing of forests for agricultural purposes was encouraged, but as urbanization has increased, reliance on local land for food has diminished. This shift has led to a growing disconnect between people and the land, while simultaneously elevating the importance of forest conservation.

It is important to emphasize that the plantations not only provide direct employment but also enable individuals to establish their own contracting businesses. Additionally, these plantations can enhance the overall value of the land, contributing positively to the local economy.

Australian Bluegum Plantations has undertaken several initiatives to support local communities in its plantation areas. These include inviting students from Casterton Secondary College to participate in ABP's native species revegetation programme, sponsoring the wood chop competition at the twenty-sixth annual Heywood Wood, Wine and Roses Festival in February 2020, and sponsoring the Albany Gunslingers, the local Western Australia entry in the annual transnational Cancer Council Car Rally.

Australasian bittern in a wetland

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2.8. Environmental values and impacts

The environmental benefits of forestry include protection of soil resources and wildlife habitat, reduced demand for wood fibre from natural forests, sequestration of carbon, and improvement in water quality.

It should be noted that in some water-deficient sites, trees can lead to reduced water availability due to rainfall interception by the canopy and through transpiration processes. This is sometimes addressed through regulations limiting locations where large plantations are permitted.

Plantations can also quickly become habitats for indigenous fauna (and sometimes flora), which can create management challenges to ensure that harvesting does not overly threaten those species. This may result in seasonal changes in activities (for example, avoiding the nesting season for birds), relocating species at harvest time, changing harvest setting sizes to minimize impacts, or creating a mosaic of landscapes that might better support those indigenous species.

Australian Bluegum Plantations has adopted various programmes to protect and enhance indigenous wildlife. Targeted field surveys are undertaken to identify the presence of threatened species in high conservation value forest areas. Field surveys include dusk and dawn stag watches (viewing hollows in trees), ground surveys for scat or diggings, bio-acoustic recorders and remote wildlife cameras. Once any threatened species are identified, targeted management programmes are developed to improve habitat conditions, mitigate threats and collect vital data that can be shared with external research and conservation organizations.

One example is a pair of rare Australasian bitterns (*Botaurus poiciloptilus*) that were found in wetlands adjacent to one of the plantation areas in June 2020. Efforts to protect the birds and their habitat are now part of the management of this location. Australian Bluegum Plantations has implemented conservation works in consultation with the Glenelg Hopkins Catchment Management Authority and BirdLife Australia to prioritize the revegetation of native species along the edge of the wetland to create a buffer from the adjacent road. As part of this programme, ABP increased efforts to control fox populations in the area and will install permanent bio-acoustic recorders as part of the research and conservation works being undertaken by the above-mentioned organizations.

Australian Bluegum Plantations has a zero-harm goal for the tens of thousands of koalas (*Phascolarctos cinereus*) that have moved into its blue gum plantations from nearby national parks. Any harvest operations in the “koala zone” must have expert spotters deployed to work ahead of the harvest machines to identify koalas. Once a koala is located, its tree and nine surrounding trees are left in a cluster and remain standing until the koala leaves.

Australian Bluegum Plantations is continually reviewing, trialling and adapting new technologies and work practices to respond to the increasing koala population and the challenges involved in locating koalas in dense foliage.

2.9. Challenges and threats

Societal challenges include lack of skilled staff due to changing demographics (falling birth rates and an ageing population) and increased migration of youth to urban areas.

Biological threats are potentially increasing as climate change and global warming intensify, although the extent of the threats will vary for different species and locations. For example, pests and diseases that have temperature thresholds for their survival may be able to occupy sites that previously were not suited to them. Similarly, growing a forest crop well requires appropriate levels of temperature, rainfall and nutrients to maximize growth. As these change, sites that were once well suited may become increasingly marginal and vice versa.

In Australia, a significant risk is fire. Every year, and with increasing frequency, large areas of forest are damaged or destroyed by fire. The area of forest damaged in parts of southeastern Australia has more than doubled in the past three to four decades, although there is some evidence that managed plantations have reduced the risk when compared to unmanaged natural forest.

2.10. Opportunities

Since acquiring Timbercorp, ABP has expanded the area under plantation and increased its holdings of freehold land, with over 60 percent of the estate now on freehold tenure. This shift provides greater security for the business and its customers. In contrast, leasehold land involves an outside party with interests that may limit management flexibility. For example, if the lease requires trees to be harvested by a certain date, a soft market may result in lower returns compared to waiting for a cyclical increase in prices, which is an option under freehold ownership.

In forestry, there are significant opportunities to improve operations while working across large areas of land. These include advancements in remote sensing and digital technology. Another substantial opportunity lies in tree breeding and genetics, especially as innovations such as tissue culture, clones and gene editing become more widely adopted and accepted.

There are additional opportunities in the marketplace. The world increasingly seeks to protect remaining forest resources but continues to need wood fibre and products that come from this raw material. As the move away from oil-based packaging and energy gains pace, demand for renewable and sustainably grown natural resources like wood fibre are increasing.

2.11. Partnerships

As a private business, ABP evaluates most investments (either financial or other) through the lens of “economic return” or “licence to operate”. These investments include partnerships with research organizations or other businesses to promote improved forest management or achieve other outcomes that increase returns on investment. At a minimum, such initiatives seek to safeguard the current level of returns being generated.

The types of partnerships or investments that private forest plantation companies may pursue include efforts to genetically improve the planted trees to enhance growth, improve tree health or to alter wood properties such as density, structure and stiffness. Similarly, they will invest in technology for harvesting and processing to reduce costs or increase productivity, as well as in data capture and management tools.

2.12. Innovation, recognition and outreach

Timbercorp was noted as being an innovator in forest management practice prior to its collapse. The new owners have continued to seek innovation to ensure that forest growth is maximized, the health and safety of people involved in the business are protected, and the economic outcomes are maintained.

This last point is imperative for all businesses, but especially so for those producing largely undifferentiated commodities such as woodchips. To distinguish itself from other companies in the market, ABP focuses on being the lowest-cost producer and meeting customer expectations in terms of product quality, timely delivery and desired specifications.

Australian Bluegum Plantations has further innovated in forestry with technology like backpack lidar, which uses light detection and ranging (lidar) for inventory purposes. This technology provides large volumes of highly accurate data at a relatively low cost. Lidar can analyse trees at a level of detail that is unattainable using other methodologies.

3. KEY LESSONS LEARNED

Commercial forestry has an unusual cash flow profile when compared to many other business or investment sectors. The most notable issue is the time frame from establishment to harvest or, from a financial perspective, from investment to the realization of returns. Overlaying this are issues of risk (climate, fire, biotic challenges and markets) that must be factored into decisions.

What is universally true for pure greenfield commercial forestry is that significant investment is required during the establishment of the forest (land must be purchased or accessed and trees sourced and planted), a lower level of investment is required while the trees are growing, and then further investment is needed prior to harvest (the largest being building roads). Only then can return be made on the investment.

The time over which this occurs ranges from a decade for fast-growing pulpwood crops to several decades and even centuries for sawlog crops. Throughout this wait, the risks noted above remain in play.

This demand for capital with no return for a long time makes debt a real possibility until harvest begins or until the forest is in a steady state. To avoid debt, a greenfield investor needs either alternative sources of ongoing capital or significant capital seeking investment.

Timbercorp's decline is evidence of this problem: As soon as the incoming funds dried up after regulatory change, the business became unsustainable. For the new owners, with uncommitted capital, the possibility of buying a significant asset below cost and with no need for significant immediate cash flow was an attractive proposition.

Therefore, the key learning is to understand the cash flow profile of a prospective or real commercial forest plantation and to ensure a reliable source of funding that will not dry up. Whether the cash comes from new investors or government incentives, these sources can change rapidly. Commercial forestry is often well suited to pension funds, which have a steady inflow of capital seeking investment opportunities and no immediate demand for returns for a few years or even decades.

A second key lesson comes more directly from the forest. The drive to innovate with a focus on efficiency can significantly enhance the profitability of ventures like commercial forests. In the almost two decades since the previous report was prepared, there have been substantial changes in forestry. These include widespread adoption of remote sensing, digital data capture and management, artificial intelligence, and machine learning; mechanization of many operations; and advances in genetics and tree improvement.

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Koalas feed on a limited range of eucalyptus species and thrive in some blue gum plantations

Timbercorp prided itself on the level of innovation it brought to its rapidly expanding estate, with early adoption of digital data capture and mechanized forest chipping as two clear examples. The new owners have maintained this focus on innovation, striving to leverage all available new technologies.

4. FUTURE OUTLOOK

Australian Bluegum Plantations continues to grow its investment in blue gum plantations, building on the foundation laid by the purchase of the Timbercorp assets. Its forested area has continued to grow despite some leased areas being returned to the owners; ABP is increasing the percentage of the estate that is held as freehold land and continues to invest in infrastructure, such as port developments. Importantly, ABP continues to innovate. It is investing funds on behalf of its clients, which indicates that both ABP and its underlying investors remain confident in the future.

At a strategic level, the demand for renewable products, an increasing focus on the circular bio-economy, and the development of new technologies and products suggest that the role of and demand for forests will increase over time. Globally, there has been significant growth in the production of forest-based products – for example, wood pellets are forecast to have a compound annual growth rate of 7.6 percent between 2023 and 2032.

Demand for packaging, driven by the rise of e-commerce, will potentially directly influence the demand for type of hardwood chips produced by ABP.

The pressing need to reduce greenhouse gas emissions and replace fossil fuel-based products is resulting in an increased demand for bio-based products. Forests will be able to satisfy a significant part of this demand.

Governments are also working to eliminate the risk of greenwashing – that is, companies, manufacturers and retailers making unsubstantiated claims about the environmental benefits of products. For example, in 2023 the European Union announced that such claims will not be permitted unless supported by independent verification or scientific evidence. The use of certification programmes, such as that by the FSC, to provide independent verification is expected to gain greater prominence in the forestry sector.

All forests – including large commercial forests such as that held by ABP – will play a meaningful role in moving human society towards a more sustainable future.

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ASIA-PACIFIC

CASE OF CHAUBAS: COMMUNITY FOREST MANAGEMENT AND SAWMILL IN DISTRESS

Shambhu Dangal, **Niraj Babu Bhatta** and **Pawan Karki**, RECOFTC

NAME OF FOREST	**Chaubas-Bhumlu community sawmill and the community forests of Chapanigadi, Dharapani, Fagarkhola and Racchma**
LOCATION	**Bhumlu Rural Municipality, Kavrepalanchok District, Bagmati Province, Nepal**
AREA (ha)	**232.5**
MANAGING ENTITY	**Chapanigadi, Dharapani, Fagarkhola and Racchma forest user groups; Chaubas-Bhumlu community sawmill management committee**
MANAGEMENT OBJECTIVES	**Timber production; income and employment generation**
FOREST TYPE	**Planted pine (*Pinus patula*) forest**

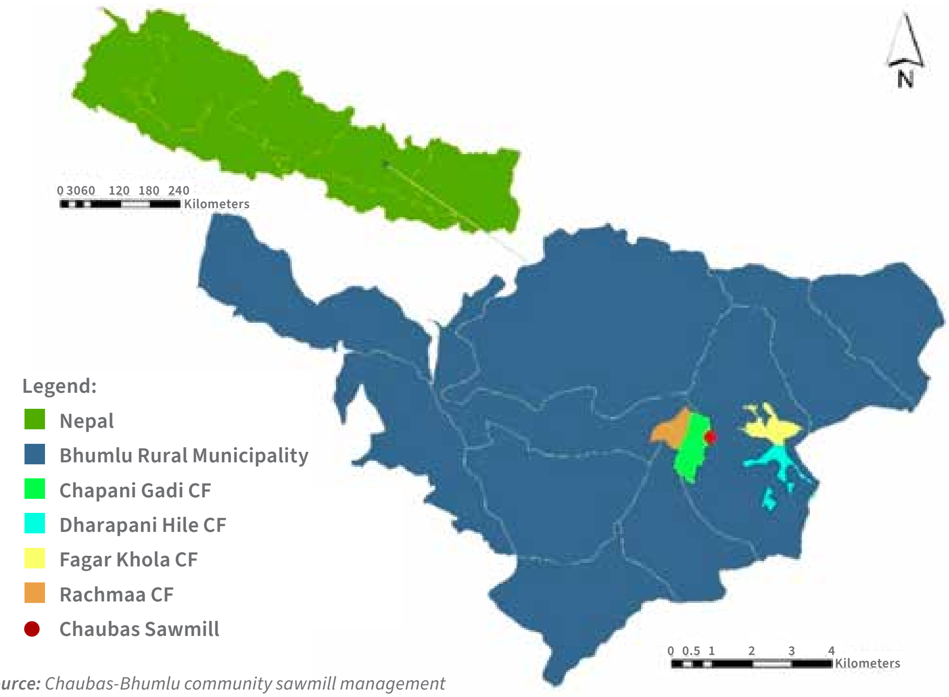
1. INTRODUCTION

In the aftermath of the Himalayan crisis in the 1970s, Nepal received assistance from various government and non-governmental organizations to implement afforestation projects, including support from the Government of Australia to rehabilitate the degraded hills of the Kavrepalanchok and Sindhupalchok districts through forest plantations. These bilateral projects established over 26 000 ha of monoculture pine plantations (Hunt *et al.*, 2001).

Within Kavrepalanchok, around 400 ha of barren hills in Chaubas were rehabilitated in the early 1980s. The forest produced marketable saw logs, but transportation posed a challenge due to the absence of road connections. A feasibility study conducted by the project recommended the establishment of a collectively managed sawmill involving four communities: Chapanigadi, Dharapani, Fagarkhola and Racchma (Singh, 2005).

The Chaubas-Bhumlu community sawmill has gone through significant ups and downs since its registration in 1996. Initially, the mill generated substantial income and employment and was regarded as a successful model that could be replicated nationwide (Singh, 2005; Timsina, 2005). However, in the mid-2000s, the mill experienced a decline in performance and profitability for a number of reasons, including the gradual withdrawal of external support, a decade-long Maoist insurgency, inadequate supply of timber, a legal requirement for a competitive bidding process to obtain timber, and inconsistencies in the policy and practice of thinning. The mill ceased operating in 2006, reopening for brief periods in 2008 and 2012 with donor-funded project support. In 2016, the mill started operating again under a lease contract to a private company. At first, the mill thrived as earthquake-affected

Figure 1. *Location of the Chapanigadi, Dharapani, Fagarkhola and Racchma community forests and the Chaubas-Bhumlu community sawmill*


N
0 30 60 120 180 240
Kilometers
Legend:
🟩 Nepal
🟦 Bhumlu Rural Municipality
🟩 Chapani Gadi CF
🟦 Dharapani Hile CF
🟨 Fagar Khola CF
🟧 Rachmaa CF
● Chaubas Sawmill
0 0.5 1 2 3 4
Kilometers

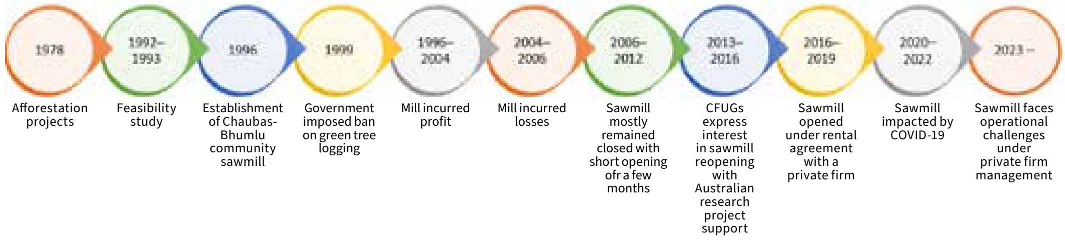
Source: *Chaubas-Bhumlu community sawmill management committee. n.d. Operational plans for the Chapanigadi, Dharapani, Fagarkhola and Racchma community forests*

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

communities sought log processing services for constructing homes (Shrestha *et al.*, 2022). There was also strong demand for timber in Kathmandu. However, by 2020, demand dwindled as post-earthquake construction was completed and the COVID-19 pandemic arrived. The private company leasing the mill struggled to operate profitably and ceased paying rent, prompting the leaders of the four community forest user groups (CFUGs) to explore alternative solutions. Along with the mill's decline, community forest management and protection deteriorated from 2006 onwards.

This case study highlights the factors and underlying causes contributing to the downturn of forest management and the community sawmill. Moreover, it offers valuable insights into the socioeconomic dynamics of the local community, exemplifying a transformation from the early phases of development project support to post-disaster recovery and then to a more stable yet evolving economic context.

Figure 2. *Evolution of forest management and the Chaubas-Bhumlu community sawmill, Kavrepalanchok, Nepal*


1978
Afforestation projects
1992–1993
Feasibility study
1996
Establishment of Chaubas-Bhumlu community sawmill
1999
Government imposed ban on green tree logging
1996–2004
Mill incurred profit
2004–2006
Mill incurred losses
2006–2012
Sawmill mostly remained closed with short opening of a few months
2013–2016
CFUGs express interest in sawmill reopening with Australian research project support
2016–2019
Sawmill opened under rental agreement with a private firm
2020–2022
Sawmill impacted by COVID-19
2023 –
Sawmill faces operational challenges under private firm management

Source: Authors' elaboration

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Mature trees in Racchma community forest damaged by windstorm

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The objectives of forest management reflect a notable transformation. Initially, the village economy was predominately farm-based and subsistence-oriented (Shrestha *et al.*, 2022). The objectives of forest management and sawmill establishment included meeting the subsistence needs of local people, promoting local employment, generating income for the community and enhancing local livelihoods. With the rapid change in the socioeconomic context since 2010, the management objectives have shifted towards economic incentives through timber commercialization.

2.2. Type and condition of forest and scale of operation

The four community forests, totalling 232.5 ha, are dominated by exotic pine (*Pinus patula*) plantations established in the late 1970s to mid-1980s. While three of the community forests consist mainly of *P. patula* plantations, the Fagarkhola community forest stands out as a mixed forest, with natural broadleaf species, including *Alnus nepalensis* and *Schima wallichii*, alongside some planted areas.

Delayed harvesting and insufficient thinning have resulted in over-mature and over-dense pine plantations that are prone to uprooting by strong winds. This, in addition to lack of fire prevention and uncontrolled grazing, has resulted in significant damage to the forest.

2.3. Legal status and management structure

All four CFUGs were registered in the 1990s at the District Forest Office. The Nepal–Australia Community Forestry Project supported the communities in developing a business plan, a sawmill management agreement and the legal documents required to register the Chaubas sawmill (Timsina, 2005). The CFUGs officially registered the Chaubas-Bhumlu community sawmill at the District Cottage and Small Industries Office in 1996. The representatives of these four CFUGs are the mills' owners, until they transfer ownership, which has not yet taken place.

Established as Nepal's pioneering community-operated sawmill, the mill was managed by the four CFUGs through a sawmill management committee.

The management committee originally comprised 17 members but was later downsized to nine members representing two individuals from each CFUG and a sawmill manager.

The sawmill agreement mandated that all saw logs produced by the four CFUGs be supplied to the mill, which retained 20 percent of the profits for maintenance, while the remaining 80 percent were distributed to the four CFUGs based on the volume of timber supplied (Timsina, 2005).

2.4. Regulatory environment and government support

There have been several changes in legal provisions related to forest management and timber supply that have affected the Chaubas-Bhumlu community sawmill. Under the Forest Act 1991 and Regulation 1994, the community could make its own decisions on the sale and transport of timber by giving early notice to the Divisional Forest Office. This right was curtailed in 2003 by a government directive that mandated forest product auction procedure. Though this directive targeted government-managed forests, its application was extended to community forests as well. As a result, communities had to follow a lengthy auction process to sell timber produced beyond their local needs. Consequently, the mill lost its primary source of timber and started to rely solely on timber from private forests.

In 2006, the Department of Forests Research and Survey approved thinning guidelines for pine plantations. This enabled communities and government staff to implement thinning in plantations effectively. In 2014, the government introduced the Scientific Forest Management guideline. This guideline targeted the management of natural forests, but an attempt was made to generalize its application to all types of forests. As a result, the management of pine plantations deteriorated. The guideline was scrapped in 2020, as it was criticized for not promoting SFM.

Following the new federal system, the new Forest Act (MoFE, 2019) and Forest Regulation (MoFE, 2022) incorporate multiple provisions to promote SFM and entrepreneurship (MoFE, 2019, 2022). The new forest regulation continues to allow the sale of surplus timber, with a provision to inform the District Forest Officer of the sale price. The regulation also allows supply of wood to CFUG-managed enterprises at a royalty rate fixed by the government. As per the new forest regulations, CFUGs are no longer required to undergo an auction process when selling timber to their own mills.

The Forest Act gives local authorities the power to approve the collection and transport of forest products from private forests for commercial purposes, making it easier for private forest owners to sell timber outside the sawmill at the

Current condition of the Chaubas sawmill

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higher market rates. However, this provision has not yet been put into practice because the timber extraction and sales have been halted in Nepal for some time because of unclear volume calculation formulae and disputes over certain provisions in the forest regulations.

Moreover, since the new federal governance system was introduced, communities are now levied triple taxes (by local, provincial and federal governments) amounting to over 30 percent when selling timber outside the community. This has placed a substantial financial burden on CFUGs. As provisioned by the Constitution, Forest Act 2019 and Forest Regulation 2022, Bagmati province has approved the SFM Working Procedure 2022. This procedure is expected to break the deadlock on SFM.

2.5. Forest management practices

The communities were actively engaged in forest protection and management until the Nepal–Australia Community Forestry Project phased out in 2006. The communities had developed and implemented a simple forest operational plan with an annual thinning plan and a straightforward procedure for harvesting and selling timber with technical support from the project and District Forest Office. However, forest management practices have declined sharply over the last 15 years because of socioeconomic and regulatory changes, as well as legal issues involving CFUG Executive Committee members and the mistrust created as a consequence of elite capture.

Over the last ten years, only 1 144 m^3 of timber have been removed through thinning in 20.4 ha, which is less than one-quarter of the potential sustainable yield. The target stem density at final harvest is 150 stems/ha. However, most stands remain at densities of above 500 stems/ha. To optimize production, *P. patula* must be harvested within 35 years and replaced with a new crop (Dangal and Das, 2018) as specified in the forest management plans. However, harvesting has already been delayed by five to ten years for the above-mentioned reasons. Delayed timber harvest and insufficient thinning has exposed mature trees to uprooting by strong winds, causing significant annual timber damage. Weak coordination among forest users has led to uncontrolled fires and livestock grazing, resulting in further degradation of community forests.

Despite the deterioration of forest management, there have been some positive developments. The action research project Enhancing Livelihoods from Improved Forest Management in Nepal (EnLiFT) (2013–2018) developed the capacity of community and District Forest Office staff to manage and promote natural regeneration in these forests. There are a few successful cases of broadleaf tree regeneration within pine plantations. In addition, the seed tree method has been piloted in some places, where 15 mother trees per hectare are left standing to provide a source of seeds for the next generation of trees. This has resulted in notable natural regeneration of *P. patula* in open spaces. Furthermore, a few communities have tried growing cardamom and jatamansi plantations, though not on a commercial scale.

2.6. Production and business aspects

The sawmill has gone through many ups and downs in its operation. The mill stopped operating in 2006 after the end of the Nepal–Australia Community Forestry Project, which supported the establishment of the mill. It remained closed until the devastating earthquake of 2015, except for two brief periods when operations were revived with the support of the Medium-Scale Enterprise Development Programme within the United Nations Development Programme Nepal (funded by Australian Aid).

With support from EnLiFT, the mill reopened in 2016 by leasing to a private firm for an annual fee of USD 1 850 (Nuberg *et al.*, 2019). The mill thrived, catering to the demand for sawn timber for post-earthquake construction. Over 2 000 m^3

of sawlogs from private and community forests were produced in two years. The mill was closed entirely during the COVID-19 pandemic and was leased out again to a private firm in February 2021. The company operated for one year, producing 63 m^3 of sawlogs with timber received from private land. The sawmill generated revenue of USD 5 384 from 2018 to 2023. The mill has been fully closed since 2023, though community members are trying to revive it.

In these community forests, over 4 700 m^3 of timber could have been harvested over the last ten years based on the annual allowable cut; however, only 1 144 m^3 was harvested. Dangal and Das (2018) concluded that because of delays in harvesting, these forests have already lost the annual potential growth of 8.8 m^3/ha, equivalent to USD 871/ha.

The CFUGs prefer to sell their timber outside the community, where they can receive a higher price compared to selling to the sawmill. This is despite the auction requirement and the triple taxes imposed on the CFUGs when they sell their timber outside. With the availability of chainsaws, community members can efficiently cut logs onsite, eliminating the need to transport logs to the mill for primary processing.

2.7. Social aspects and impacts

The members of the four CFUGs represent a diverse ethnic composition, including Brahmin, Chhetri, Dalit, Pahari and Tamang. Their executive committees have representation from all major ethnic groups. There has been increased women's participation in committees to comply with the mandate of a minimum of 50 percent women's representation, but their involvement remains inconsistent. For instance, the executive committees of the Chapanigadi, Racchma, Dharapani and Fagarkhola CFUGs comprise 33 percent, 57 percent, 27 percent and 100 percent women, respectively. The nine members of the sawmill management board include four women and four Indigenous Peoples but no Dalits. A key informant reflected that though the representation of women in the executive committees has gradually increased, their decision-making power remains weak because of limited capacity.

Moreover, the problems associated with elite capture have been detrimental in fostering trust and collaboration. Most of the leadership positions in the executive committees have been held by elite groups, who usually stay in the urban areas

Dense, stagnant forest stand waiting for thinning

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and travel to the villages for meetings, silviculture operations and timber sales. During the early years of the sawmill establishment, executive committee members received training in financial management for small financial transactions, but this training was insufficient to prepare them for the large sums of money generated by timber sales. The executive committees' incapacity to responsibly manage this scale of operation has led to increased misuse and mismanagement of the substantial funds generated by the sawmill.[1] As a result, the committees' focus has shifted away from SFM and equitable community development towards personal financial gains primarily benefiting the elites. The poorer segments of the communities feel that they do not receive tangible benefits, financial or otherwise, from forest management; hence, they are no longer interested in protecting the forests from fire.

Local community members Khadga Kharel and Netra Kunwor estimated that the dependency of local people on forests has declined by more than 50 percent over the last 15 to 20 years. In the last ten years, there has been a massive outmigration of youth for employment and education. In addition, over 70 better-off families out of 314 in the four communities have dual residencies, such as in village and urban areas. Factors reducing the demand for forest projects include an increase in purchasing power (through remittances) for alternatives to forest products, massive outmigration, a massive decrease in cattle numbers and the recent construction of almost all houses after the devastating earthquake in 2015. However, most low-income families (around 40 percent) still live in villages and depend on forests for fuel, fodder and timber.

Though on a small scale, low-income families were finding employment opportunities at forest management and sawmill operations. For example, four years after the sawmill was established, it handled 184 m^3 of timber, generating an income of USD 25 600 with a net profit of USD 20/m^3. The employment value generated between 1996 and 2000 was USD 15 200 (Dangal, 2001).

2.8. Environmental values and impacts

There have been no landslides or major soil erosion since the establishment of the community forests. The community reported that the populations of wild animals, such as wild boar, monkeys, deer and leopards, have grown, causing increased human–wildlife conflicts. These wild animals have also encroached upon private land and settlements, harming domestic animals and crops.

Though regeneration of the *P. patula* has been notably successful, proper management is not in place to promote species diversification; as a result, pine monoculture is predominant. The annual fires have been damaging to both fauna and flora. A rural road was constructed through the forest to act as a firebreak but has instead increased the risk of fires caused by commuters as well as the chances of landslides and soil erosion.

"If the trend of fire, grazing and uprooting continues without any proper silvicultural interventions, the forest may be converted to an unproductive jungle in the next 10 to 15 years", said Kharel, a local resident who has been engaged in establishing and managing this forest since 1978.

2.9. Challenges and threats

Past efforts to revive the sawmill, as well as the experience of other similar enterprises in Nepal, suggest that community-based business management model alone may not be sufficient to complex operational challenges. The private sector will not invest unless the timber supply is steady and legal provisions for forest management and product sales are consistent. The arrival of the

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[1] Three out of four communities are currently under a legal procedure for misuse of community funds at the Commission for the Investigation of Abuse of Authority, Nepal. In November 2023, the Commission filed a case in court against three critical members of the Dharapani CFUG executive committee for fund misappropriation (DoF, 2008).

Forest Regulation 2022 and SFM Working Procedure 2022 has raised hopes of promoting sustainable timber supply.

The mill faces financial and technical challenges. The competitive market for sawlogs in urban sawmills has attracted brokers to supply timber at a price that the mill cannot afford. None of the projects succeeded in developing skilled local operators.

For the last couple of years, power chainsaws have been used for sawing in the forest itself for household use, and those who used to bring sawlogs for milling have stopped. Similarly, with legal backup, a portable sawmill has been successfully tested in adjoining districts. There is a high chance of replicating the portable sawmill in Chaubas, which may pose further challenges to the mill.

The mill is in the name of four community representatives, but not all are in leadership positions. This may lead to legal complications regarding taxing and ownership transfers if the government decides to scrutinize tax payments. The mill had promised to allocate 80 percent of its profits to the CFUGs (Timsina, 2005), but it failed to fulfil this promise for two of the CFUGs, which resulted in a loss of trust.

There is a high risk of continued exclusionary decision-making, elite capture and profit misuse. The unreliability of timber supply is a significant threat to sawmill operations, as is labour shortage due to the ageing population and migration of youth. Engaging youth in forest management is challenging, especially when there are better employment opportunities in the cities. However, it is not impossible to revitalize community groups and encourage inclusive decision-making for livelihood benefits and forest management. This will require time and significant investment in building community capacity and improving collective governance practices by breaking capture by elites.

The forest is a long-rotation crop that needs continuous silviculture throughout the rotation period. However, inconsistent legal frameworks and the unwillingness of government staff to take risks continue to threaten the completion of the forest management cycle.

2.10. Opportunities

Forest Regulation 2022 enables the CFUGs to supply forest products to an enterprise established by the CFUG or its members. However, a new institution modality (public–private partnership) in the company model should be legalized and a clear business plan for at least ten years be developed.

Product diversification should be promoted to enhance sustainability. This could include timber value addition by: seasoning and chemical treatment; municipal policy promoting the use of locally made furniture in public institutions; production of high calorific value bio pellets using waste matreials; and production of biochar and veneer. In addition, small, unused pieces of wood could be used for producing handicrafts through small-scale enterprises engaging women, Dalits and other poor community members.

The 2021 records of Srichhap Community Forests Users in Sindhupalchok indicate that silviculture intervention could generate significant employment and income. Based on their finding and an analysis of the growing stock of the four CFUGs in their operational plan, employment for 11 500 people and a total income of USD 450 000 could be generated in the next ten years in Chaubas. Such economic development may reduce youth outmigration. However, certain fundamentals need to be re-established, such as providing maximum livelihood-related incentives to the poor, who are not actively involved in forest management at present.

There are examples of municipalities leveraging funds to implement the comprehensive livelihood improvement plan developed by communities and integrated into the municipality plan as directed by Forest Regulation 2022. In 2021, the Bhumlu municipality spent USD 5 000 for CFUG mobilization and allocated USD 50 000 for forest-based enterprise development. But these funds could not be utilized due to a conflict of interest among stakeholders. The current legal frameworks encourage forest management to improve forest quality and income generation. However, the complex procedure for selling timber to markets must be simplified. In addition, proper capacity building and incentive mechanisms for government and community members are needed to motivate them to reassume responsibility for forest management.

Beyond the fate of the mill, viable opportunities can be found in SFM and sale of timber from the community forests to outside markets with favourable rates, particularly given the use of new technologies and machinery such as power chainsaws for cutting the timber onsite.

2.11. Partnerships

Sawmills, forest-based traders and CFUGs are intrinsically linked to one another. Some partners are legally bound, while others are voluntary. Legally, community forestry is a partnership between the government and communities for the management of forests. When sawmills operate as a company, communities play the role of partners for timber supply. The local timber brokers are trade partners. The ongoing EnLiFT project phase II[2] provides technical and capacity support to smooth sawmill operations and forest management. However, the legacy of such projects tends to disappear a few years after the project's conclusion.

The mill has been leased to the private sector, which sets up the opportunity for the local government to invest in the mill as a public–private partnership model company aimed to produce diversified products instead of timber only. Sustainable forest management can be continued through the proper coordination among the communities, the District Forest Office and local government.

2.12. Innovation, recognition and outreach

With the support of EnLiFT, the communities have demonstrated the low-cost method of natural regeneration in pine plantations – a result that has been incorporated into the SFM Working Procedure 2022. The sawmill's operations and forest management practices have garnered significant interest from researchers, policymakers and practitioners seeking to study the processes and extract valuable lessons.

3. KEY LESSONS LEARNED

The case of community forest management and the Chaubas-Bhumlu community sawmill highlights several key lessons in community-based forest management and enterprise development in Nepal.

- Voluntary collective action in sawmill operations or community forest management may no longer be relevant given the changing socioeconomic context. Financial incentives equal to or exceeding labour market wages are necessary to win the participation of youth from poor communities.
- Continuation of SFM practices requires commitment from government staff and community members, supported by a consistent and conducive policy environment.
- Communities need continuous capacity building to enable response to new challenges and emerging opportunities.
- A financially viable business can be viewed as a revenue source by the government and elites, who gradually capture the economic benefits, sidelining the real forest users.
- A steady supply of raw materials and markets are critical to the success of any enterprise. Enterprise development should be demand-driven for long-term sustainability and should not depend on external project support.

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[2] For more information please visit https://enliftnepal.org/

4. FUTURE OUTLOOK

With the firm new policy and regulatory provisions for promoting SFM for ecological, social and economic benefits, the scope for SFM has been enhanced. This can halt outmigration by providing local employment opportunities and boosting both the local and national economies through the sale of timber and entry into the carbon market.

The Chaubas-Bhumlu community sawmill is a legacy and a reference for many policymakers and practitioners. There is an opportunity to give new life to the mill by changing its legal status to a public–private partnership company, providing shares to individual households and outsiders, and diversifying its products.

Mobilizing and leveraging funds from the community and the municipalities can transform the sawmill into a learning site that empowers communities, increases participation in decision-making, and improves livelihoods and SFM through collaborative partnerships between the municipality, government agencies and CFUGs.

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ASIA-PACIFIC

DIAMOND RAYA TIMBER: A CONCESSION AT A CROSSROADS

Unna Chokkalingam, International Forestry Expert

NAME OF FOREST	**PT Diamond Raya Timber concession**
LOCATION	**Bagan Siapiapi, Riau Province, Indonesia**
AREA (ha)	**85 155**
MANAGING ENTITY	**PT Diamond Raya Timber**
MANAGEMENT OBJECTIVES	**Sustainable timber production**
FOREST TYPE	**Natural tropical rainforest on peat-swamp**

1. INTRODUCTION

The PT[1] Diamond Raya Timber (DRT) concession was licensed in 1978. At the time, there was little forest disturbance, since 98 percent of the area was inhospitable peat-swamp forest and the population in the area was low.

In the 1990s, a new public road to the nearest town of Bagan Siapiapi led to improved access and population increase, resulting in more pressure from encroachment and illegal logging. There was high interest from the local government and the local population in converting forest land to oil palm. The initial DRT area of 135 339 ha (ground check), or 115 000 ha (formal license), was reduced to 90 956 ha in 1996, with roughly 33 000 ha handed over to the local government and communities and another 10 000 ha in the buffer zone handed over to oil palm plantations for transmigrants. The remaining natural forest belonging to DRT became a refuge for tigers displaced when surrounding areas were converted to pulpwood or oil palm plantations.

Timber harvesting in DRT is labour-intensive and costly. It has also remained below the annual allowable cut (AAC), given the difficult peat-swamp environment and the need to use low-impact manual harvesting and hauling methods.

With interest in timber production through sustainable forest management emerging in Indonesia in the 1990s, the Ministry of Forestry (now the Ministry of Environment and Forestry, MoEF) designated DRT as a concession eligible for forest certification, with the capacity to act as a model for replication. Diamond Raya Timber was unique in many ways. It contained some of the last remaining undrained natural peat-swamp forests in the area. It was the only concession producing ramin (*Gonystylus bancanus*),[2] which was locally abundant and in high demand in the European and North American markets. As ramin was listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)[3] in 2001, forest certification was required to harvest it.

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[1] PT stands for *Perseroan Terbatas*, which is a type of limited liability company.

[2] A protected species listed as Critically Endangered on the International Union for Conservation of Nature's Red List of Threatened Species

[3] For more information please visit https://cites.org/eng/taxonomy/term/41508

Diamond Raya Timber was first certified in 1999 by Lembaga Ekolabel Indonesia (LEI), the first national forest certification scheme, then earned a joint certification with the FSC and LEI (2001–2006). It was jointly certified again by FSC and LEI from 2006 to 2011, and since then by FSC.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

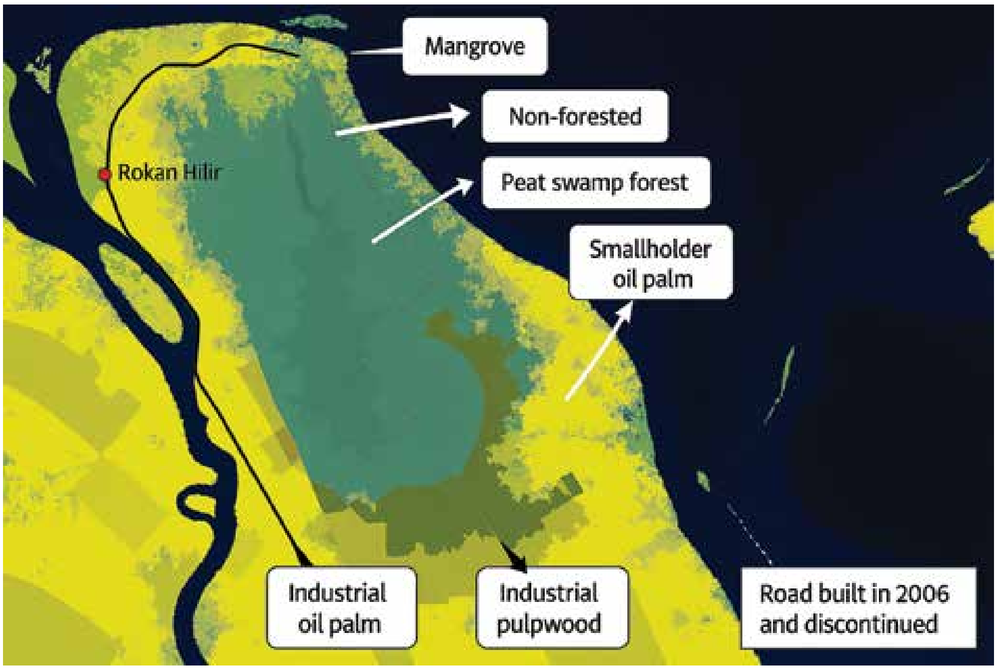
The main forest management objective remains sustainable forest management for commercial timber production. "It has been the company's dream to expand into other potential options such as agroforestry, ecosystem services and ecotourism", said Fourry Meilano, Forestry Product Manager of Société Générale de Surveillance (SGS) Indonesia. "However, DRT has been caught up in encroachment and degradation pressures which it has been trying to stop and reduce."

Diamond Raya Timber's vision of the ten-year management plan is to become the best company in sustainable natural forest management, which includes ensuring management of forest resources in a sustainable manner; optimizing forest production; and guiding a secure social balance with local communities.

2.2. Type and condition of forest and scale of operation

Since 2010, the areas marked for production and protection have been reduced by 20 percent and 7 percent, respectively, to 53 829 ha and 11 047 ha to adjust for the roughly 29 000 ha that has been deforested and degraded over time following encroachment adjacent to roads built alongside and through the concession (**Figures 1** and **2**; see Section 2.9).[4] The DRT concession currently occupies around 85 155 ha, with 4 000 ha excised in 2017 for an agroforestry partnership programme

Figure 1. *Outline of PT Diamond Raya Timber (white dashed line) and land cover in 2021*



Source: Nusantara Atlas. n.d. *Nusantara Atlas*. [Cited 18 December 2024]. https://nusantara-atlas.org/
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

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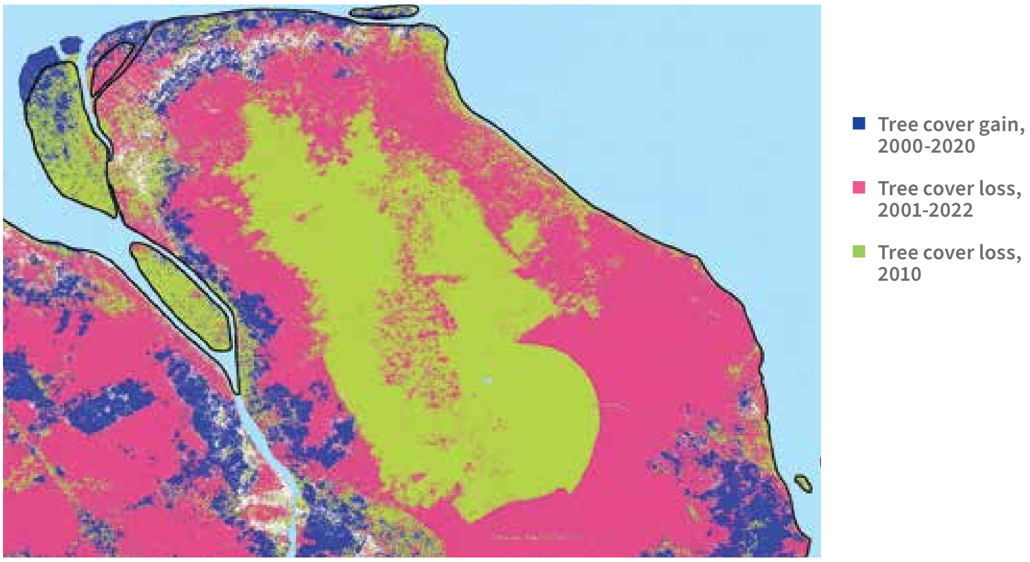
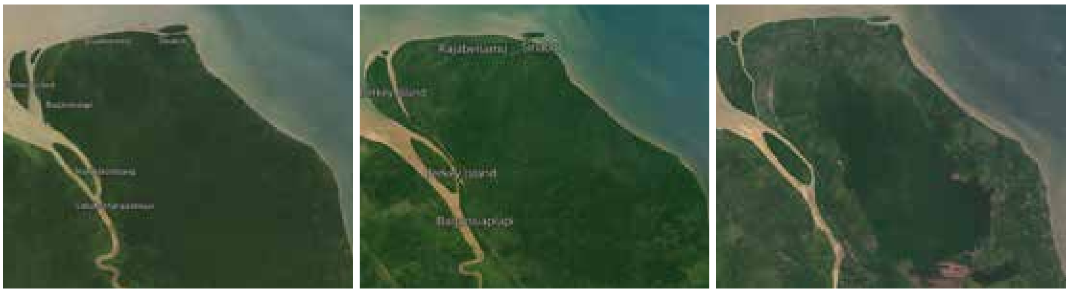
[4] The area sizes provided here and in Section 1 are rough estimates drawn from various documents. Further information for providing exact sizes was unavailable.

Figure 2. *Drastic change in vegetation – tree cover loss and gain between 2001 and 2021*



Source: World Resources Institute. n.d. *Global Forest Watch*. [Cited 18 December 2024]. https://www.globalforestwatch.org/
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

Figure 3. *Forest and land cover change in the area from 1989 to 2003 to 2020*



1989 2003 2020

Source: Google. n.d. *Google Earth Pro*. [Cited 18 December 2024]. https://earth.google.com/web
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.
Images: © Google Earth, 2024

between DRT and the local communities created to resolve land claims and stop further encroachment. Other initiatives such as forest rehabilitation and bioenergy development in conjunction with the local community are being explored for the remaining encroached areas.

The forest in the core concession area is in relatively good condition according to audit reports, interviews with key respondents and recent satellite imagery (**Figure 3**). A substantial proportion (59 187 ha, or 70 percent) of the concession is categorized as high conservation value (HCV) forest.

2.3. Legal status and management structure

The DRT concession license was renewed again for 55 years in 2019, when many natural forest concession licenses in Indonesia were being revoked because of lack of production or non-compliance with regulations. Diamond Raya Timber belongs to the Uniseraya group of companies, and the management structure has not changed. There is no officially recognized customary ownership or use rights within the concession area.

Diamond Raya Timber has five distinct divisions each with a manager covering different operational activities: planning and mapping, harvesting, community development, forest protection and safeguards, and research and environmental development.

2.4. Regulatory environment and government support

Beyond voluntary certification, Indonesian forest concessions and value chains are now governed by a mandatory domestic third-party Timber Legality Verification System,[5] which regulates timber legality and Sustainable Production Forest management, including social and environmental aspects. Diamond Raya Timber has received Sustainable Production Forest management certification for 2013–2018 and 2018–2024 and was granted a permit from the Riau Natural Resources Conservation Center (*Balai Besar Konservasi Sumber Daya Alam Riau*) to harvest ramin for five years starting in December 2017.

Indonesia plans to reduce forest and land use sector emissions and convert them to net sinks by 2030 (MoEF, 2022a), including through mitigation actions in natural forest concessions, peatland management and maintained HCV forests. The MoEF Regulation No. 8/2021 allows forest concessions to have additional business activities besides the utilization of timber, including businesses based on non-timber forest products and environmental services. These regulations provide an enabling policy environment for sustainable natural forest management and for expanding the range of products and services.

Social forestry schemes (based on MoEF Regulation 9/2021) can be implemented within forestry concessions through partnerships as part of efforts to resolve tenure conflicts and restore areas already used by communities for non-forestry activities. Diamond Raya Timber's 4 000 ha agroforestry partnership with local communities falls under this scheme and is aimed to shift monoculture farming towards agroforestry systems.

There have been conflicts between DRT and the local government, who has been interested in converting the area to oil palm from early on. In 2006, the local government began building a public road within the northeast part of the concession, connecting Mekar Sari with Darussalam Village (IndependensI, 2018). Since this road development was contradictory to government regulations and DRT's rights as concession holder, it was discontinued in early 2007. Local government objected to the extension of DRT's license in 2019 on the basis that MoEF had not consulted them, that regional interests were trampled on and that DRT activities have not benefited the local community (GoRiau, 2014).

2.5. Forest management practices

Diamond Raya Timber's current activities are guided by a ten-year forest management plan (2019–2028), which includes provisions for forest inventory, annual planning, environmental management and monitoring plans, social impact assessment, HCV assessment, and a set of standard operating procedures. Since DRT holds a valid forest certification, it can self-approve its own annual plans, including its AAC according to its ten-year forest management plan.

At DRT, logs are harvested and extracted by manual labour and light rail systems because the peatland cannot support heavy motorized vehicles. A permanent, 8-km rail line runs through the forest. Off this line, temporary feeder lines are laid to access the cutting blocks and then are dismantled after harvesting and follow-up monitoring and silvicultural activities. Once the rail has been dismantled, access is largely closed. In this way, the natural condition of the forest is maintained. Drainage of peatlands is avoided to reduce fire risks. The company has fire prevention and control measures in place.

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[5] For more information please visit https://silk.menlhk.go.id/index.php/info/phpl

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Logs extracted manually and by light rail

Diamond Raya Timber follows the Indonesian selective cutting and replanting system (TPTI) with some modifications. It uses a cutting rotation of 40 years and a 40-cm minimum diameter (more stringent than the TPTI requirement of 30 cm). Current harvest levels are within sustainable limits as indicated by various data sources (including forest inventory data, production data, a growth and yield model, and permanent sample plot data).

Most of the harvested area is naturally regenerated since peat-swamp forests have regular seeding with blanket coverage. Supplementary planting with local species is carried out in certain heavily disturbed areas, such as ex-log landings and around rail lines, to restrict invasive species.

2.6. Production and business aspects

The concession produces logs predominantly of *Shorea* spp. and *Palaquium* spp. The majority of DRT's products are sold to its sister company, PT Panca Eka Bina, which produces and exports mouldings and plywood. End customers are mainly from Europe and Asia (Yunita, 2022).

After ramin was listed in CITES Appendix II in 2005, DRT was the only forest concession in Indonesia allowed to harvest and export ramin as a certified concession. Nevertheless, international demand for ramin declined because of customs documentation obligations and because some ramin products did not meet the market's quality requirements (Utama, 2011). Diamond Raya Timber's exports of ramin declined from over 7 000 m^3 in 2002 and 2003 to 1 200 m^3 in 2010. There has been no harvesting of ramin since 2010.

Timber production has been highly variable, ranging from 41 600 to 74 500 m^3 per year between 1999 and 2005. Annual production has declined over time both in total volume and as a percentage of the AAC, from 51 086 m^3 (57 percent of AAC) in

2010, to 33 586 m^3 (30 percent of AAC) in 2016, and 26 164 m^3 (23 percent of AAC) in 2021.

Across Indonesia, log production from natural forests from 2017 to 2021 was below annual targets, while log production from industrial plantation forests from 2018 to 2021 was higher than the annual targets (MoEF, 2022b). “Prices for plywood, the main product from natural forest timber, is low”, said Hartono Prabowo, country manager for FSC. “There are premium prices for certified wood but it’s insufficient to cover the high costs of harvesting from natural forest concessions. Plywood production in Java, based on the use of lower-cost smallholder plantation timber for the core along with *Shorea* spp. or other imported timber for the outer layers, is more viable.”

The number of natural forest concessions in Indonesia has been declining over the last 30 years (Bramasto, 2022). In Riau, the numbers dropped from 66 concessions covering an area of 6.1 million ha in the 1970s (Hardiyanto, 2005) to 17 concessions totalling 1.1 million ha in 2003. Today, DRT is the last remaining active concession in Riau. Since the 1990s, much of the former concession has been converted to oil palm and pulpwood plantations. Given the high operating costs and low profitability (MoEF, 2022b), natural forest timber concessions struggle to compete with oil palm and pulpwood plantations.

2.7. Social aspects and impacts

Community members around DRT are mostly of Malay origin, except for two transmigrant villages (Labuhan Tangga Baru and Bantaian Baru) where nearly 80 percent of the inhabitants come from Java. There were 25 villages in 2017, with 86 821 people in total, and 26 villages now, with a total population of 92 187. There are no Indigenous Peoples or customary rights within the concession area, but there has been encroachment by migrants because of increased access.

Tagged timber at log yard and loaded onto barge for transport to the processing industry

©SURYA DHARMA/PT DIAMOND RAYA TIMBER

©SURYA DHARMA/PT DIAMOND RAYA TIMBER

Job training and preferential employment are given to local communities. About 58 percent of DRT's 386 workers came from the local population in 2017, with similar numbers in 2022. Health officers and facilities are available in the camp and are accessible to all workers. Diamond Raya Timber has an established conflict-resolution process and staff are trained in conflict resolution. It also has an engagement process with affected or interested stakeholders, with recorded minutes from meetings and follow up on identified issues.

There has been increasing infrastructure development in many of the villages, with improved road access and socioeconomic opportunities. Most people around DRT make their livelihoods as fishers or farmers (of paddy rice or other horticultural crops). Oil palm plantations have helped improve socioeconomic conditions in the villages, particularly in the south. Only a small number of people generate income from forest products.

Diamond Raya Timber has developed a social forestry partnership programme,[6] through which the community has received a Forest Utilization Permit from MoEF, which allows them to harvest non-timber forest products but not timber. Non-timber forest products such as rattan, mushrooms and firewood are collected and used by communities. There are requests from another village and a new farmer group for additional agroforestry partnership programmes; these are currently being reviewed by DRT. Beyond the agroforestry partnership programme developed on 4 000 ha, other initiatives are being explored and negotiated for other encroached areas.

2.8. Environmental values and impacts

Diamond Raya Timber implements a 20-metre biodiversity strip policy, leaving 5 ha in every harvesting block as a conservation area to reduce harvesting impact and provide wildlife corridors. According to the updated management plan for 2019–2028, 13 738 ha within the concession (including the biodiversity strips) are designated for protection without harvesting. In line with the company's SOP for environmental management and monitoring, riparian buffer zones have been identified, mapped and demarcated on the ground. Contractors have been provided with training on environmental management.

The forest management plan lists the flora and fauna species found in the concession area that are protected by MoEF regulations. These are five tree species and nine animal species, including ramin, Sumatran tiger and the sun bear. Natural habitat conditions for wildlife are stable in the undisturbed forest area, whereas in logged-over areas they are less suitable. The presence of wildlife in the concession is monitored through sightings by the workers. Environmental monitoring reports from 2012 record three tiger sightings, and from 2019 one tiger sighting. Over the years, tiger–human conflicts have been reported in and near DRT, including in 2019 (PT Mutuagung Lestari, 2006; EoF, 2013; DataRiau, 2019).

Diamond Raya Timber management continues to collaborate with the World Wild Fund for Nature and the Riau Natural Resources Conservation Center on biodiversity conservation programmes, especially for the Sumatran tiger. It has also worked with adjacent pulpwood concessions belonging to PT Suntara Gaja Pati and PT Ruas Utama Jaya to establish the Senepis-Buluhala Sumatran Tiger Conservation Area (approved by the Ministry of Forestry in 2006). Most of the conservation area falls within DRT's concession designed for tiger conservation and is well preserved. However, continued natural forest clearing in the pulpwood plantations has been reported (EoF, 2011).

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[6] Under the scheme *Pengakuan dan Perlindungan Kemitraan Kehutanan* (KULIN KK), which translates to Forestry Partnership Recognition and Protection

Diamond Raya Timber has monitored water quality in three major rivers and tested the water quality from wells in the camp location, concluding that management activities have not significantly impacted water quality around the concession.

One study indicated that logging in DRT resulted in medium residual stand damage (Harmawan, 2013), while another found that harvesting had caused heavy damage to 77 percent of the residual stands, moderate damage to 14 percent and light damage to 9 percent (Suwarna *et al*., 2014). Based on seedling and sapling surveys in logged and unlogged stands, Mawazin and Subiakto (2013) concluded that logged-over areas are expected to recover through natural regeneration by the next cutting rotation.

2.9. Challenges and threats

There has been high degradation within the natural forests belonging to DRT, as well as conversion pressures. There are only two natural forest concessions left in Riau, and only DRT is active. The area is surrounded by oil palm and pulpwood plantations (**Figures 1** and **2**). Many occurrences of illegal logging, peat drainage and encroachment have been reported in the press, along with demonstrations by the local communities over land rights (OkeLine.com, 2018; riau86, 2019; seriau, 2021). Although the public road that the local government developed within the concession was discontinued in early 2007, it provided access for encroachers who cleared thousands of hectares of forests and claimed the land. There was substantial land speculation.

The presence of the oil palm plantation company PT Sindora to the west of DRT, combined with the presence of transmigrants, led to the expansion of the oil palm plantings. Many people in the southern villages have cultivated oil palm, and this is also starting to occur among the communities in the north. However, land conversion attempts were not always successful given the deep peat soils. By 2015, there were up to 29 000 ha of degraded or barren land within the concession area.

Diamond Raya Timber has been attempting to stop the rising encroachment and resolve land conflict in the area through a range of approaches. According to Meilano, “Agroforestry and other efforts to date have not been fully successful and there has been continued conflict in these areas. Dealing with encroachers is a sensitive political issue.”

2.10. Opportunities

The Indonesian government’s commitment to reduce emissions in the forest and land-use sectors, including through the implementation of sustainable forest management and peatland management, as well as the 2021 regulation promoting diversified businesses in forest areas, has created an enabling policy environment for sustainable natural forest management and for an expanding range of products and services. However, the utilization of environmental services, such as forest carbon trading, still requires clearer regulations and viable alternative business models. The potential for ecotourism and carbon benefits for DRT has been explored through scientific studies (Yuono, 2009; Effendi *et al*., 2018).

2.11. Partnerships

Diamond Raya Timber has collaborated with educational institutions to study the regeneration ecology and growth dynamics of peat-swamp forests. Additionally, as mentioned earlier, DRT has collaborated with NGOs, the local government and forest plantation companies on biodiversity conservation programmes, with a particular focus on protecting the Sumatran tiger.

2.12. Innovation, recognition and outreach

Diamond Raya Timber has maintained its FSC forest management certification since 2001, establishing its credibility in responsible forest management. The company takes pride in its legacy as the first certified concession to practise sustainable management of natural peat-swamp forests while protecting biodiversity, including species such as tigers and ramin. These efforts were notably recognized in 2019 with the renewal of its concession license, at a time when other production forest licenses in the country were being revoked.

3. KEY LESSONS LEARNED

The following are key factors that have enabled DRT to continue operating as a natural forest concession amid a surrounding landscape dominated by oil palm and degraded peatland ecosystems:

- commitment to long-term sustainable forest management objectives and practices, and pride in its legacy; and
- national government support, from the early encouragement for certification, to long-term license renewal and the search for sustainable options to reduce local conflicts over land use.

However, other factors make the long-term sustainability of the overall operations challenging:

- Lack of compelling benefits and effective partnerships: Insufficient engagement with local stakeholders, local governments and communities has resulted in widespread encroachment and conflict, gradually reducing the area under DRT's control and under sustainable forest management.
- Incoherent and uncoordinated goals and policies: Misalignment among different levels and sectors of government (e.g. local vs. national, forestry vs. agriculture and social development, conservation vs. infrastructure development) has exacerbated degradation and conversion pressures.
- Low economic viability: The natural forest concession model currently struggles to remain economically viable, with limited ability to share benefits with local populations compared to more profitable alternatives, such as oil palm plantations.

4. FUTURE OUTLOOK

The future outlook for sustainable forest management at DRT hinges on its ability to overcome the formidable and growing pressures of degradation and land conversion. Achieving this will require building strong and effective partnerships with local communities and the local government, fostering a joint interest in restoring and managing the concession and the surrounding landscape for the mutual benefit of all stakeholders and the environment.

It will also depend on DRT's ability to innovate and develop a viable and sustainable commercial business model with diversified products, advanced technology and strategic partnerships aligned with evolving markets and societal demands. Options could include generating revenues from high-value, innovative timber products and leveraging biodiversity and environmental services from the extensive HCV forest area. In 2018, FSC introduced a procedure to demonstrate the positive impact of responsible forest management on ecosystem services, which forest managers can use to access ecosystem services markets.

At the time of the 2022 FSC audit, the eradication of illegally planted oil palm was being negotiated with the local communities. Following this, DRT, in collaboration with MoEF, plans to undertake the following initiatives: (i) restore 4 735 ha of degraded forest area and enhance fisheries and marine resources; and (ii) replant 19 524 ha of bare land and smallholder oil palm areas, now classified as non-forest land, with native species, particularly for bioenergy development, in collaboration with local communities.

Frank Momberg of Fauna and Flora International proposed potential options for DRT to address land-use conflicts and contribute to landscape-level environmental conservation.

"A ring of social forestry for restoration could be created around DRT to stabilize forest boundaries", he suggested.

Local people could be employed to patrol the concession area, fixed winged drone monitoring could be a cost-effective approach to monitor encroachment, and performance-based payments could be given to local communities for restoration, reforestation and protection efforts, possibly supported by carbon finance. A REDD+[7] project could also engage the surrounding oil palm smallholders and plantations to adopt zero-fire agricultural practices (*Program Desa Bebas Api*), improve the management of their water table and block any canals reaching into the concession to reduce peat subsidence. Successful lessons learned based this approach can be seen in APRIL's[8] restoration concessions and ring plantations on the neighbouring Kampar peninsula in Riau province.

The future outlook also depends on political will and leadership at both the central and local government levels across sectors to provide appropriate incentives and reconcile conflicting goals and policies for long-term sustainable forest management. This includes harmonizing road, utility, agriculture and other community development projects with forest, climate and environmental protection goals.

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[7] Reducing Emissions from Deforestation and Forest Degradation, plus the sustainable management of forests, as well as the conservation and enhancement of forest carbon stocks

[8] For more information please visit www.aprilasia.com/en/

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HUOSHAN COMMUNITY FORESTS: SHIFTING FOCUS FROM POVERTY ALLEVIATION TO FOREST ECOSYSTEM SERVICES

Jiang Chunqian, Chinese Academy of Forestry

NAME OF FOREST	**Huoshan County community forests**
LOCATION	**Huoshan County, Anhui Province, China**
AREA (ha)	**3 000**
MANAGING ENTITY	**Individual forest farmers and Huoshan County Forestry Bureau**
MANAGEMENT OBJECTIVES	**Multiple use; forest ecosystem services**
FOREST TYPE	**Subtropical natural and planted forest**

1. INTRODUCTION

In 2005, successful community forest management practices in Huoshan County, Anhui Province, China, were featured in the FAO publication *In Search of Excellence: Exemplary Forest Management in Asia and the Pacific*. The case study highlighted the positive impact of social forestry activities in improving the environment and raising the living standards of people in one of poorest areas of the country through social forestry (Jiang, 2005).

The community forestry practices were promoted as part of the China–Netherlands Poverty Alleviation Project implemented from 1997 to 2002. Approximately 16 000 individual farmer households from 68 villages across nine townships participated in the project, which covered 3 000 ha of managed forest. Farmers were encouraged and supported to transition from farming on marginal, degraded slopes to establishing plantations of economically valuable species, such as chestnut, bamboo, oil camellia and medicinal plants, while simultaneously regenerating degraded slopes and conserving soil and water.

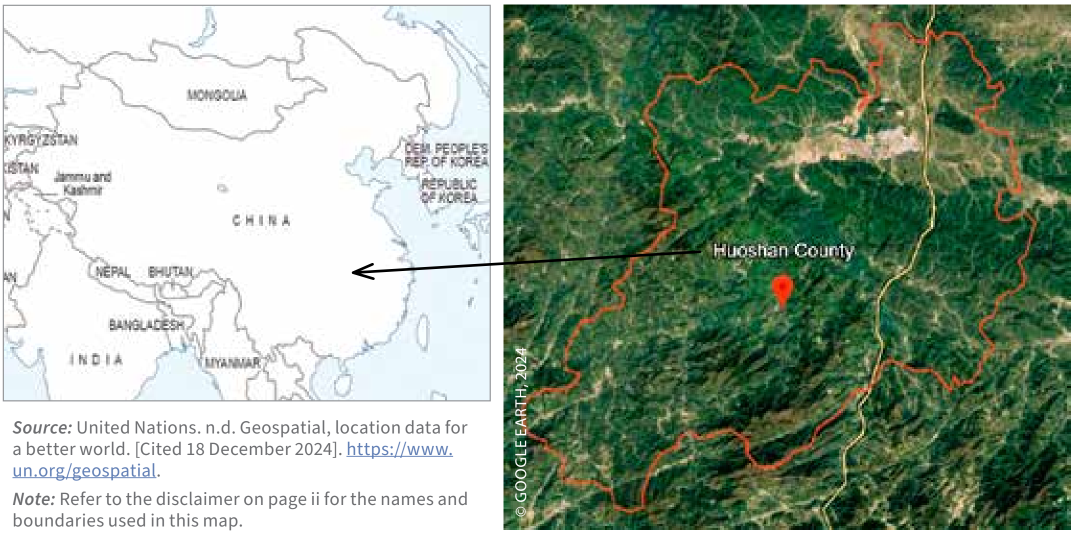
This review, based on desktop research, site visits and interviews, captures key changes and developments in Huoshan County community forests over the past two decades.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The management objectives for the Huoshan County community forests were modified from “multiple use and poverty alleviation” to “multiple forest ecosystem goods and services”. This change was influenced by a national forest policy shift prioritizing ecological conservation and environmental stewardship as the economy developed. The shift was further motivated by the prolonged stagnation of timber prices and escalating labour costs in recent years. The cultivation of Chinese fir (*Cunninghamia lanceolata*) for timber and chestnut trees (*Castanea mollissima*) for fruit, which was prevalent two decades ago, has since been abandoned, as timber and chestnut extraction have become less economically attractive compared

Figure 1. *Huoshan County, Anhui Province*



Source: United Nations. n.d. Geospatial, location data for a better world. [Cited 18 December 2024]. https://www.un.org/geospatial.

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

to alternative employment opportunities. Interest in bamboo also declined owing to low prices and high labour costs.

There is now a concerted effort to promote forest-based tourism and wellness retreats within forest habitats. Emphasis is also being placed on diversifying forest-based benefits, including by cultivating high-value understorey plants such as *Ganoderma lucidum* (a medicinal mushroom), *Dendrobium huoshanense* (an orchid with a long history of medicinal use) and *Polygonatum cyrtonema* (a medicinal herb in the Asparagaceae family) in Huoshan. Additionally, the cultivation of economic forests, notably of *Camellia oleifera*, is receiving prioritized governmental support (Gao, 2023).

2.2. Type and condition of forest and scale of operation

Some economic forests have been converted to other species mainly because of low market prices. For example, many chestnut forests were abandoned or changed into tea, Moso bamboo (*Phyllostachys pubescens*) and Masson's pine (*Pinus massoniana*), with *D. huoshanense* in the understorey.

According to the 2014 forest survey conducted by the Huoshan Forestry Bureau, the forested area in Huoshan County expanded from 149 969 ha in 2004 to 159 099 ha in 2014. The condition of the forests has consistently improved, with a reduction in low-quality and inefficient forest areas and an enhancement in the ecological services they provide. The forest survey is conducted every 10 years and will be updated in 2024.

The area of planted forests increased by 12 percent, from 70 408 ha to 78 806 ha, while natural forests increased from 79 561 ha to 80 293 ha. By forest category, the areas designated for timber, fuelwood and special-purpose forests have all experienced significant reductions. In contrast, protective forest areas have grown from 37 843 ha to 111 013 ha. The area designated as a public welfare forest has surged from 38 520 ha to 111 833 ha, while the area of commercial forests shrank from 111 449 ha to 47 266 ha (**Table 1**). The marked increase in public welfare forest areas and the decline in commercial forest areas reflect national policy changes that prioritize forest conservation.

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Unmanaged chestnut trees

Table 1. *Forest areas by category in 2004 and 2014, Huoshan County*

	FOREST TYPE	2004 (ha)	2014 (ha)
Natural vs planted	Natural forest Planted forest	79 561 70 408	80 293 78 806
Forest category	Timber forest Economic forest Shelter (or protective) forest Fuelwood forest Special purpose forest	98 206 7 682 37 843 3 461 391	36 125 9 969 111 013 1 832 160
Ownership	State forest Collective forest	5 999 143 970	5 687 153 412
Management objective	Public welfare forest Commercial forest	38 520 111 449	111 833 47 266
Total forestland area		**149 969**	**159 099**

Source: Forest Survey, Huoshan Forestry Bureau, 2014. Unpublished internal report.

2.3. Legal status and management structure

The Forestry and Grassland Bureau of Huoshan is the county's forestry management authority, with forestry stations established in each township. Between 2007 and 2013, as part of the collective forest tenure reform, farmers received forest rights certificates for up to 70 years, which strengthened their legal forest ownership and use rights over the forestland. Households receiving use rights can legally mortgage, inherit, lease, sell and otherwise transfer their forestland. Mergers of villages and townships do not influence individual farmers' forest tenure.

In recent years, most young and middle-aged people have migrated to cities for work, leading them to transfer their forestland to private forestry operators or other farmers within their villages. For instance, in Changchong village of Tai-Pin-Fan Township, approximately 17 ha of forestland belonging to 35 households were transferred to a private company established by a villager. The transferred forestland is mainly planted with *D. huoshanense*. The forestry operators implement more intensive management practices, resulting in increased production and higher profits (Chen and Li, 2023).

The Chestnut Farmers' Association and the Bamboo Farmers' Association ceased operations because of the low market prices for the chestnut and bamboo materials used in construction. These associations were replaced by cooperatives, but these cooperatives do not function well in managing the chestnut and bamboo resources. They are managed by people whose primary motive is to exploit the government's cooperative-related policies on loans and project funding. The Demonstration Households for chestnut no longer fulfil their intended roles because they lack updated techniques and they earn low profits from chestnut management. The head of a Demonstration Household for *D. huoshanense* became the chairman of a private company dealing with *D. huoshanense.*

2.4. Regulatory environment and government support

Since the government imposes a quota on timber harvesting, farmers are required to submit applications to the township forest station to obtain permission for timber harvesting. However, according to interviewees, the application process is cumbersome, and they prefer not to go through this process.

The government encourages farmers to develop forest management plans by offering a significant increase in the allowable timber harvesting volume and simplified logging procedures for those who have such plans. However, the many steps and forms required to develop a forest management plan discourage many farmers from pursuing this option. Local forestry authorities hope to promote the transfer of forest and forestland to forestry operators to expand the scale of forest management in villages and make forest management more profitable.

The government has issued numerous supporting policies to promote forest restoration and sustainable forest development. These include initiatives such as "cash for green" (converting croplands to forests on steep slopes), oil tree planting, and organic and green product certification. Additionally, some farmers' forests located along streams and water bodies are designated as public welfare forests (or ecological forests) and receive an annual compensation payments of Chinese yuan (CNY) 180–270 (USD 25–38) per ha from the government.

D. huoshanense *cultivation under the canopy of* **P. massoniana**

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Secondary forest designated as public welfare forest

2.5. Forest management practices

Previously, individual farmers were the primary forest managers. Now, with more varied management entities emerging (e.g. cooperatives, large-scale forest operators, companies), forest management has become more intensive, necessitating the development of forest management plans. Entities managing non-timber forest products (NTFPs) beneath the forest canopy have also shifted from small-scale and individual operations to more intensive, large-scale corporations. For example, *D. huoshanense* cultivation requires sizable initial investment and is therefore usually managed by larger-scale operators.

In the past, the operational model was predominantly afforestation. Currently, the focus has moved to improving forest quality through measures such as tree thinning to optimize forest density, incorporating valuable tree species and tree tending. In the management of Chinese fir and Masson's pine, mixed plantations with broadleaf trees and large-diameter timber are now encouraged. In terms of afforestation species, bamboo and Chinese fir were the primary choices in the past. Now there is a significant focus on supporting the growth of high-value plants, such as tea oil camellia and understorey medicinal plants such as *G. lucidum*, *D. huoshanense*, tall Gastrodia (*Gastrodia elata*), Poria (*Wolfiporia cocos*) and *P. cyrtonema*. For harvesting, labour is sourced from outside the community or through contractors working in Huoshan.

The farmers are increasingly opting to grow more bamboo shoots than before. In bamboo stands, farmers practise thinning to maintain optimal stem density. They also cover the soil with rice straw to keep the soil moist and favourable for the growth of new shoots, particularly during the spring season when bamboo shoots are in demand and command premium prices.

Forest farmers and companies leasing forestland from farmers are required to adhere to national policies and regulations concerning eco-environment protection in their forest management practices. These include measures for soil and water conservation, as well as the protection of valuable species.

Forest fire management practices have also changed. Farmers are now employed as forest rangers and receive a monthly salary of CNY 600 (USD 83). In the event of forest fires or pest and disease outbreaks, the forest rangers immediately report the incidents to the village committee and township forestry station. These authorities then assign a professional team specializing in forest fire prevention and forest pest and disease control to address the situation. In 2010, the government supported the establishment and provision of equipment for the professional teams specialized in forest fire, pests and disease.

In the past, some individual farmers collected seeds and cultivated seedlings. However, most other nurseries, including those for *G. lucidum*, *Poria* and *P. cyrtonema* are now managed by professional entities such as companies and forest farms that specialize in seed provenance and seedling quality. Individual farmers buy seeds and seedlings from these companies or other farmers. At the county level, new techniques are being adopted in forest management, including the use of geographic information system software for forest resource management by the Huoshan Forestry and Grassland Bureau.

2.6. Production and business aspects

Bamboo processing is a significant industry in forest product processing, with seven bamboo processing factories located in Da-Gan-Jian Village within the Zhe-Fu-An Township. The domestic bamboo product market peaked around 2012; since then, the profitability of bamboo processing enterprises has steadily declined. With the unfavourable macroeconomic environment and the explosive growth of the bamboo processing industry in China, the market is now oversaturated, leading many bamboo product enterprises to the brink of bankruptcy. Other factors contributing to this situation include the emergence of alternative products in the market (such as boards made from herbal granules and other waste materials, replacing bamboo boards), changes in consumer habits leading to reduced use of bamboo products, and higher labour costs for wood and bamboo products, making them less competitive. The price of bamboo for construction is at CNY 500 (USD 69) per tonne. The daily cost of harvesting raw bamboo has risen from CNY 150 (USD 21) per person in the past to CNY 300 (USD 42) per person currently.

The extraction of timber and chestnuts is no longer economically feasible compared to other employment opportunities and has therefore been discontinued. Most farmers who continue to manage forests have shifted their focus to the economy beneath the forest canopy, specifically NTFPs. The villagers reported approximately 10 preliminary processing factories for *G. lucidum* and *Poria* in Song-Lin Village, and about 20 preliminary processing factories for *D. huoshanense* in Changchong Village, both located in Taiyang Township. *D. huoshanense* is a local species mainly grown in Huoshan and considered a specialty product with a strong market price.

The local government has invested in infrastructure for farmers, reducing transportation costs and indirectly increasing income from forestry and agriculture. Farmers have pivoted to businesses like homestays, agritourism and forest tourism. The government encourages farmers to develop forest-based homestays and ecotourism. The farmers have expanded their houses to accommodate tourist stays in Song-Lin Village.

2.7. Social aspects and impacts

The rural population in Huoshan has become less dependent on forestry for income generation. Twenty years ago, the villagers' annual income was about CNY 1000 (USD 125) per person and was mainly from forestry. Today, seasonal labourers can earn about CNY 200–300 (USD 28–42) per day from working in urban areas. The villagers' annual income is up to CNY 10 000 (USD 1 428) per person. Consequently, managing forests has become less economically attractive, prompting the working-age population to migrate to cities for higher-paying jobs. As a result, some forests, especially secondary forests in mountainous villages, are currently not managed, and villagers no longer engage in nursery management. Conversely, reduced timber harvesting has contributed to substantial ecological improvements in the region.

Collective forest tenure reform has clarified forest boundaries and rights, significantly reducing conflicts among local farmers.

2.8. Environmental values and impacts

Due to constraints in local economic and technological capabilities, Huoshan County lacks specialized personnel for evaluating and monitoring forest management. As a result, the county has had to rely on government projects and research institutes for limited-scale monitoring and evaluation of forest operations.

Over the past two decades, a series of key national ecological projects have been implemented in Huoshan, such as "Forest Quality Improvement in Dabie Mountainous Area" and "Soil and Water Conservation towards Ecological Restoration". Conservation efforts, along with ecological compensation payments to forest owners and reduced human disturbance, have enhanced the quality of secondary forests. They have also increased forest ecosystem services such as water conservation and purification, reduced soil erosion, and biodiversity conservation.

2.9. Challenges and threats

Due to land-use policies and the Three Rights Separation policy (i.e. the separation of forestland ownership, contracting rights and management rights), the current household-based tenure system somewhat hinders the development of large-scale forest operations. Individual farmers own small plots and operate independently, making it challenging to achieve industrialized forest management and higher economic returns.

Currently, forests allocated to rural households are scattered, remote and located in areas with poor transport infrastructure, making their development and utilization difficult. Some areas also suffer from a lack of forest diversity and challenges in controlling pine wood nematode (*Bursaphelenchus xylophilus*). Additionally, an ageing population in forested areas and a shortage of labour mean that there are insufficient human resources to implement effective forest management.

A high proportion of low-quality and unproductive forests severely limit the potential for developing the local forestry economy. Meanwhile, soil erosion and chemical pollution, resulting from intensive management of economic forests, will impact water and soil conservation.

2.10. Opportunities

Responding to the national strategies such as "Carbon Neutral", "Lucid Waters and Lush Mountains Are Invaluable Assets", and "The Mountains, Rivers, Forests, Farmlands, Lakes, Grasslands and Deserts are Part of the Community of Life", Huoshan County promotes the principles of ecological priority and green development. Guided by the rural revitalization strategy, and with the goals of maintaining ecological security and enhancing ecological carrying capacity, the county aims to develop sustainable, nature-based industries and ecologically liveable environments.

Furthermore, there will be a strong emphasis on preserving forest health and developing the under-forest economy (NTFPs), forest-based ecotourism and other ecological products. In later stages, it is hoped that relevant national departments will provide policy and financial support. They should guide and assist ecotourism enterprises to achieve high-quality standards, improve facilities and strengthen project development and management.

2.11. Partnerships

Partnerships between the Forestry Bureau and forest farmers have remained relatively unchanged; the Forestry Bureau and associated forestry stations give policy guidance and technical support. Even through many forest farmers' cooperatives have been established, most have yet to realize their full potential because of a limited understanding of the National Farmers' Cooperatives Law and the dispersed location of farmers. Partnerships among forest farmers, as well as between forest farmers and forestry operator companies, need to be strengthened.

2.12. Innovation and outreach

Under national guidelines, Huoshan implemented forest tenure reform and forest chief schemes, where the governor or leaders at different administration levels act as forest chiefs, with an office established in the Forestry Bureau. The National Forestry and Grassland Administration and the Anhui Forestry and Grassland Bureau have recognized the county as the National Demonstration County on Forestry Tenure Reform, the National Leading County on Soil and Water Conservation, and the National Leading County on Getting Rid of Poverty.

Technical training courses, such as those on forest carbon sinks and Camellia management, are conducted every year for forest technicians and managers. Additionally, the Huoshan Forestry and Grassland Bureau establishes demonstration sites for the cultivation of both bamboo timber and shoots, organizing local farmers to learn these techniques.

3. KEY LESSONS LEARNED

Changes in national policies and increased urbanization bring both opportunities and challenges. Forest management needs to continue balancing people's livelihoods, environmental protection and socioeconomic benefits. As a key ecological mountainous area in China, Huoshan should be given more national and provincial policy support.

The main factors that drive farmers' decisions on forest management are economic benefits, policies and laws. Successful forest management can be achieved by promoting ecotourism and cultivating local speciality forest products, such as *D. huoshanense.*

The China–Netherlands community forest demonstration project aimed to alleviate poverty among farmers. However, the economic benefits generated from the forest are insufficient to meet the rising income expectations of these farmers, especially given the rapid economic development over the past two decades. This shortfall is primarily due to the limited area of household forestland and low market prices for forest products. Furthermore, the cooperatives that have been established need to become more transparent and effective.

To consolidate the achievements made in forest restoration, a financial mechanism supported by government investment (such as payment for environmental services) should be maintained for public welfare forests. For commercial forest areas, management methods that link restoration and utilization, such as ecotourism and cultivation of NTFPs, should be encouraged.

4. FUTURE OUTLOOK

Concerning the long-term impacts of climate change on forests, substantial evidence points to an increase in forest pests and diseases, particularly the pine wood nematode, which has affected pine forests in Huoshan, China. To enhance resilience and adaptability, it is recommended to promote broadleaved tree species that are better suited to the changing climate, as they can provide a diverse range of products and services.

The local community's livelihood dependence on forest products is expected to continue declining, due to enhanced livelihood opportunities and urbanization. However, forest owners stand to benefit from addressing climate change and contributing to national eco-environment initiatives. They can achieve this by selling certified emission reduction credits, receiving ecological compensation payments, and trading forest goods and ecosystem services.

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ASIA-PACIFIC

IMABARI FOREST: PASSING ON THE FOREST LEGACY TO THE FUTURE GENERATION

Kenichi Shono, FAO

NAME OF FOREST	Imabari City Forest
LOCATION	Imabari City, Ehime, Japan
AREA (ha)	2 439
MANAGING ENTITY	Imabari City
MANAGEMENT OBJECTIVES	Multiple use with a focus on watershed protection and disaster mitigation
FOREST TYPE	1 548 ha of planted conifer forest and 892 ha of mostly natural broadleaf forest

1. INTRODUCTION

The city of Imabari is located in Ehime Prefecture on the island of Shikoku in southwestern Japan. The region is prone to natural disasters, with typhoons and droughts frequently devastating the area. The city's population is concentrated in the coastal floodplains, with hills and mountains up to an elevation of 1 200 metres dominating the rest of the landscape. For many years, the major concerns of the people in the city have been to manage the excess water during times of flooding and to alleviate water shortages during droughts. Considerable emphasis has been placed on regulating water flow through careful management of the mountainous forests in the region.

Soja River passes through central Ehime, forming the Imabari floodplains before flowing out to Seto Inland Sea. The river has had a history of causing devastating floods and has been known as a "man-eating river". During the feudal era (prior to 1868), the governing feudal lords attempted to protect the Soja River watershed by: (i) regulating access to and harvesting of forest products; (ii) constructing and maintaining dykes; (iii) straightening the meandering river; and (iv) dredging the riverbed. The watershed forest was communally used by farmers for collection of fodder, fuelwood and other forest products.

With the establishment of central government control in 1868, such de facto communal and private land ownership was no longer recognized. Many communal forests were nationalized in the absence of identifiable "owners" to whom the land could be allocated and taxed. However, the experience with the Imabari–Tamagawa–Asakura forests was markedly different. In 1880, the local farmers, fearing the loss of their communal lands, petitioned the prefectural governor to recognize their communal property rights. Despite initial refusals, the government finally granted communal ownership of the forest in 1890. By 1926, the ownership rights vested in towns and villages had evolved into a

©IMABARI CITY

Aerial view of the forests surrounding Tamagawa Reservoir

forest cooperative, which was recognized as a legal entity with ownership and management rights over 2 500 ha of Imabari–Tamagawa–Asakura forest.

Over the next century, the local communities, through the Imabari–Tamagawa–Asakura Forest Cooperative, worked together with exceptional cohesion towards protecting the watershed and reducing disaster risk. The cooperative has replanted large parts of the degraded watershed, mainly with Japanese cedar (*Cryptomeria japonica*) and Japanese cypress (*Chamaecyparis obtusa*). It has also introduced a long-rotation multiple-storey forest management system, initially with a 50-year cutting cycle that was later amended to 100 years.

Historically, Soja River flooded once every ten years on average. However, for more than 50 years, the river has not flooded, thanks to the protection provided by the now-mature forests and past efforts to protect and restore the watershed.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

Most of the forest area under management is designated as a protection forest,[1] and the primary forest management objectives of watershed protection and water-related disaster risk reduction have remained unchanged. There are several reasons for this management focus, including: (i) the presence of two dams in the watershed that provide water for domestic and agricultural use; (ii) repeated flooding and severe drought events in the past; (iii) friable soils in the areas that are prone to erosion; and (iv) the world-renowned towel manufacturing industry in Imabari, which depends on the soft and clean water produced by the city's watershed forest.

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[1] Protection forests are designated by the state to achieve specific public purposes such as watershed protection, mitigation of landslides and other disasters, and amelioration of the living environment. In protection forests, tree harvesting and alteration of landforms are regulated to maintain forest ecosystem functions according to their respective purposes.

During the recent decade, however, multiple-use forest management has gained more traction as climate mitigation, environmental amelioration, recreation and health benefits provided by the city's forest have become increasingly recognized and valued by the general public.

Another change in objective relates to production. Previously, when the forest was managed by the cooperative, there was a production target that had to be met to generate sufficient income to keep its staff and workers employed. However, since the city now manages the forest with an annual budget allocation that covers human-resource costs, there is no longer a production target.

2.2. Type and condition of forest and scale of operation

Currently, the city directly manages 2 439 ha of forest. Conifer plantations of Japanese cedar and Japanese cypress account for 1 548 ha (63.5 percent) of the forest area. The remaining 892 ha (36.5 percent) is broadleaf forest, most of which is naturally regenerated, with *Quercus* spp. being the most dominant species.

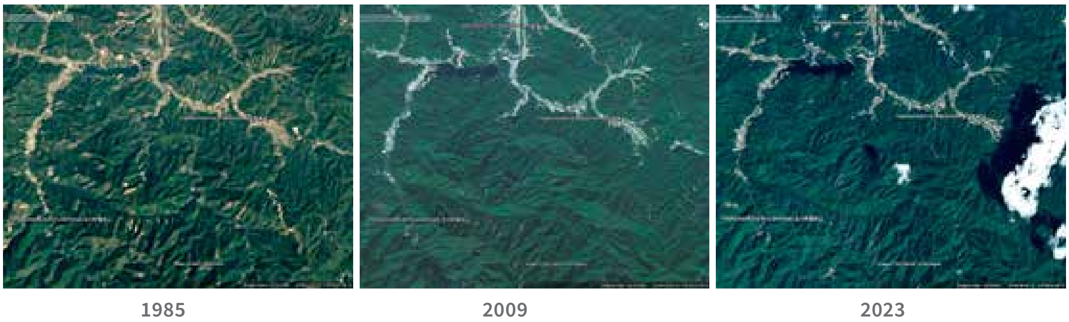
Main (final) commercial harvesting has not been conducted during the past two decades. Accordingly, the forest age class has increased, with a corresponding increase in growing stock. Over 90 percent of the forest stands are now 36 years or older and are ready for commercial harvesting.

There is a general perception that the condition of the forest and its ecosystem functions (mainly in terms of water regulation) have improved over the past two decades with the continuation of various interventions, including thinning, pruning, brushing, reforestation and restoration. At the same time, with the maturity of planted forests, there are more forest stands requiring interventions to maintain forest health and adequate stocking level. **Figure 1** shows that the forest canopy is denser, with fewer gaps in 2023 compared to 1985. Forest cover remained virtually unchanged between 2009 and 2023.

2.3. Legal status and management structure

The legal status of the forest and the management structure changed completely in 2005 when the towns and villages encompassing the 2 500 ha of cooperative forest merged into the city of Imabari to enable improved public services and more efficient governance. As a result, the cooperative lost its legal standing and was disbanded. The management responsibility for the forest area was transferred to the city government, under its Agriculture, Forestry and Fisheries Division. Two of the former cooperative staff were hired by the city and continue to spearhead the management of Imabari–Tamagawa–Asakura Forest. The city now has four full-time staff responsible for administering the city's forest, including the areas managed by private landowners and other public entities.

Figure 1. *Satellite images of the Imabari forest area in 1985, 2009 and 2023*



1985 2009 2023

Source: Google. n.d. *Google Earth Pro*. [Cited 18 December 2024]. https://earth.google.com/web
Images: © Google Earth, 2024

Of the 2 439 ha of forest managed by Imabari, 1 955 ha are owned by the city and the remaining 484 ha are managed under a profit-sharing agreement with private landowners and other entities. Overall, forests cover 22 217 ha (or 53 percent) of the city's area. Over 80 percent of these forests are privately owned. Smallholders with less than 1 ha of forest account for 78 percent of the forest landowners. Smallholders with less than 5 ha of forest comprise 97 percent of forest landowners, accounting for 61 percent of the privately owned forests in the city.

Since 1983, all forest work (including planting, harvesting, pruning and road maintenance) has been contracted out to the Ochi–Imabari Forest Owners' Association.[2]

2.4. Regulatory environment and government support

There are two recent forest-specific regulations that are expected to provide a positive impetus to forest management in Imabari.

Forest Management Administration System: Under this system, which came into effect in 2019, private forest owners can choose to entrust the management of their forestland to their municipality. The local Forest Owners' Association implements forest management activities, including planning, thinning, harvesting and regeneration, for forests that are suitable for forest production. Forests that are not suitable for production are managed by the municipality for environmental protection. This law also enables municipalities to take over the management of forests for which legal owners cannot be identified through cadastres and land tax records (MAFF, 2023a). In Imabari, 276 ha of forest are currently managed by the city under this scheme, and this is expected to increase with the ongoing efforts to identify owners of forest plots in need of management interventions.

Forest Environment Tax: This law was developed in 2018 in the context of the Paris Agreement, with the objective of providing sustainable financing for regional governments to ensure adequate forest management for climate mitigation and disaster risk reduction. Disbursement of funds to municipalities began in 2018 under a scheme named Forest Environment Transfer Tax. The Forest Environment Transfer Tax will be implemented from 2024 onwards with Japanese yen (JPY) 1 000 (USD 7)[3] collected from each taxpayer annually. At the municipality level, this can be used for thinning (including land demarcation and forest road maintenance), training forestry professionals, promoting wood use and raising awareness (MAFF, 2023c). In 2021, Imabari City received JPY 30.9 million (USD 22 370) under this scheme (Imabari City, 2022).

Furthermore, the government is promoting the use of domestic timber through various approaches, and the share of domestic timber has been showing an increasing trend during the last two decades, reaching 41 percent in 2021 (compared to 18.4 percent in 2004 when the first review was conducted) (MAFF, 2022).

2.5. Forest management practices

Approximately 460 ha (20 percent) of the forest area is managed as multistorey long-rotation forest. In these forests, intensive thinning is implemented to encourage the establishment of a second layer of crop trees, either through natural seeding or planting. In the stands established in the early days of the forest cooperative, the oldest cohort of trees are now over 100 years old, with smaller crop trees underneath and natural regeneration of broadleaf species in the understorey. The complex forest

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[2] As of 2021, there were 610 forest owners' associations in Japan managing forests on behalf of private forest owners, companies and public entities. These associations play a key role in the Japanese forest sector as they implement about half of all thinning, brushing and reforestation activities nationwide. In addition to planning and implementing silvicultural interventions, these associations also process, market and sell forest products, including not only timber but also non-wood forest products (NWFPs) (MAFF, 2023b).

[3] In this article, Japanese yen (JPY) is converted to United States Dollar (USD) at a rate of USD 1 = JPY 140.

Multistorey long-rotation forest with 100-year-old trees comprising the main canopy, with smaller crop trees underneath and natural regeneration of broadleaf species in the understorey

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structure is thought to provide better soil protection and improved water functions. The original idea was to harvest these trees with a 100-year rotation. However, the current plan is to retain these old trees for the foreseeable future.

The main interventions in the planted forests comprise thinning, sanitary cuts, brushing, climber removal and pruning to improve forest productivity, timber quality, forest health and ecosystem functions. Thinning is implemented three times before the main harvest at the ages of 13 to 20 years, 20 to 30 years, and 28 to 40 years, depending on the tree species, site conditions and growth rates, and the intended final product. Typically, each thinning removes 35 percent or less of the stocking and allows the canopy cover to recover to 80 percent of the condition at the time of thinning within five years. Road maintenance to facilitate effective and safe implementation of forest management activities has also been an important task.

In the broadleaf forests, forest management prioritizes protection and no interventions are implemented unless necessary.

Infestation by bamboo (most commonly *Phyllostachys edulis*, which was introduced to Japan centuries ago) has become a serious problem in Japan. With their exceptionally fast growth and spreading through rhizomes, bamboo dominates and eventually replaces natural and planted forests. In the past, bamboo was harvested for its useful products (e.g. edible shoots, charcoal,

A forest stand after an intensive commercial thinning

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materials for tools) and kept in check. However, with urbanization, bamboo is no longer being used. The city has rehabilitated some of the bamboo-infested areas by removing the bamboo and replanting the areas with broadleaf species. But this requires continuous interventions as bamboo will continue to sprout from its rhizomes for ten or more years.

The overabundant deer population (*Cervus nippon*) has also become a critical concern in Japan, accounting for over 70 percent of forest damage caused by animals (MAFF, 2023d). Deer browse on tree regeneration in the understorey, making both reforestation and natural seeding difficult after harvesting. They also damage planted crop trees by debarking and damaging the trunks and expose forest soils to erosion by removing understorey vegetation. The city has not found effective measures to control and reduce the deer population, given the lack of hunters and deer predators in the area. Damage by pine wood nematode (*Bursaphelenchus xylophilus*), which was serious in the past, has been brought under control in recent years through prevention and eradication efforts.

Forest fires have occurred occasionally but have been managed successfully in general, with the most recent fire events occurring in 2005 and 2008 and affecting 133 ha and 107 ha of forest, respectively.

Production of NWFPs is limited in scope and ad hoc in nature. Some people collect mushrooms and forest vegetables for their own consumption, and some of the local residents place bee boxes on the side of forest roads for production of honey.

The city commissioned a forest information system, which was completed recently and is under pilot operation. Once finalized and fully operational, all forest-related information will be compiled in the system, enabling quick access to all relevant data and records to improve the planning, implementation and monitoring of forest management activities.

2.6. Production and business aspects

There is a steady demand for cypress and cedar logs of around 24 cm to 30 cm in diameter in the local market. The large-diameter timber from the early planting period may fetch higher prices for special uses but is not readily marketable and requires the identification of buyers with specific needs and appropriate processing facilities. Also, regulations require replanting after commercial harvesting (which is done through patch clear-cutting) at a density of 3 000 seedlings per hectare. Because of heavy browsing damage caused by the overabundant

Bamboo-infested area under restoration in cooperation with a private-sector company

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Logs at the Forest Owners' Association yard ready for auctioning

deer population, planted seedlings require protection through the installation of tubes or sleeves. The cost of such reforestation activities is prohibitive and financially unviable. For these reasons, final harvesting has not been implemented in recent years.

The volume of timber harvested and sold has fluctuated in recent years as harvesting (mainly in the form of thinning) is planned based on the need to maintain forest functions rather than to meet any production target. From 2014 to 2022, an annual average of 240 m^3 of timber was removed from the forest and sold.

Harvested timber is auctioned as round logs at the Forest Owners' Association's log yard. The majority of buyers are from outside the city but within the prefecture. Imabari does not have major wood-processing facilities.

The annual operating budget for forest management is approximately JPY 10 million (USD 71 430), about half of which comes from the city's budget and the other half from private-sector company contributions (see Section 2.11). In addition, subsidies are available from the central and prefectural government for various activities, including thinning, reforestation and forest road maintenance. The city's watershed fund (see Section 2.8) has also been used to offset forest management costs (see Section 2.8). Revenues from the sale of timber from thinning go into the city coffers as miscellaneous income.

2.7. Social aspects and impacts

The population of Imabari has been falling since 1980 due to a declining birth rate and outmigration. The number of people engaged in agricultural production (including forestry and fisheries) has also been declining, with less than a quarter of the workforce remaining in the agriculture sector compared to 1975 (Imabari City, 2023). Direct use of forest resources by local communities is minimal, limited to the occasional collection of NWFPs.

2.8. Environmental values and impacts

From the early days of forest management centuries ago, watershed protection, soil conservation and disaster mitigation have been the key focus of forest management. With climate change impacts becoming more severe and greater awareness of the multiple benefits provided by forests, environmental objectives continue to drive the management of Imabari's forest.

In response to a severe drought event in 1994, the city established a watershed forest fund in 1996 with the goal to protect and improve the management of its watershed forest. By 2015, the fund had reached JPY 478.4 million (approximately USD 3.42 million). Since 1999, the fund has been used to subsidize forest thinning (covering one-quarter of the cost) and transportation of thinned logs (covering half of the cost) from the city's forests. On average, forest thinning of nearly 50 ha and transport of about 2 000 m^3 of timber have been supported city-wide annually through this fund.

In recent years, the roles of forests in carbon storage, recreational use and health benefits have been increasingly recognized as important functions to be maintained and promoted.

2.9. Challenges and threats

The biggest challenge facing the city forest is the lack of a next generation of forestry professionals. In the most recent census, only 43 people in the entire city identified themselves as engaging in forestry as their main livelihood. Most of these individuals are employed by the Forest Owners' Association, which is one of the only three forestry organizations operating in the city. There are 17 541 private forest owners in Imabari, and none of them practise forest management on their own. Instead, forest management is outsourced to the Forest Owners' Association, which takes responsibility for all aspects of forest management, from planning, tending, harvesting and replanting to marketing the timber produced.

The average age of foresters in the Association is over 60 years. Recruiting and retaining young foresters presents a persistent challenge as forestry is often not considered an ideal career option for young people due to the perception that the work is physically demanding and dangerous. The Forest Owners' Association has been reaching out to agricultural vocational schools to introduce students to forestry work, and such efforts may bear fruit in the future. However, the city is not known for its forestry, and its shipbuilding industry provides employment opportunities with higher salaries to high school and vocational school graduates.

Another key challenge for forestry in Imabari, and in Japan in general, is the small size of individual forest holdings. This, combined with the steep terrain on which most forests are located, makes forest operations inefficient and costly. The city's vision is to amalgamate these smallholdings into larger blocks over which forest management planning and practice can effectively be implemented. However, identifying and contacting the rightful owners presents a challenge as many forest parcels have been inherited by the younger generation, the majority of whom have migrated to other major cities. These new landowners may not even be aware that they have inherited such land, and cadastres are often not updated properly with their contact information. Even if the landowners could be contacted, convincing them to transfer forest management responsibilities to the Forest Owners' Association is not easy as most private forest owners have no interest in engaging in forest management.

2.10. Opportunities

There is a strong demand for timber, mainly from local buyers, and a market is ensured for any standard-sized cedar and cypress logs. Although income generation is not currently an objective of forest management, there is scope for increasing the production of logs as needed. In 2022, Ehime Prefecture ranked third nationwide for production of cypress and eleventh for cedar production (MAFF, 2023e). The prefecture is trying to brand and promote its cedar and cypress timber by ensuring a supply of standardized and high-quality wood that is price competitive and meets the current demand.

There is also increasing interest among private-sector companies in investing in forest management as part of their corporate social responsibility programmes and for carbon benefits. As the application of the national carbon trade system (J-Credit Scheme)[4] for forestry increases, there may be opportunities to create a revenue stream from the sale of carbon credits.

As with many municipalities across the country, Imabari has started utilizing the Forest Environment Tax and Forest Management Administration System to

©IMABARI CITY

Demonstration of pruning to a corporate forest sponsor

improve the condition of its forests. As these systems become more widely adopted, the integration of currently unmanaged forest stands under private ownership into the city's management is expected to continue, with the forest management activities funded through the new Forest Environment Tax.

The city has also started promoting smallholder forestry whereby private forest owners selectively harvest their forest on their own (as opposed to the standard model of entrusting such work to the local Forest Owners' Association). There may be more forest owners actively managing their forests in the future in this manner, although this approach has not been implemented by any forest owners in the city to date.

Utilization of small-diameter thinning wood for biomass is also being explored. Furthermore, there is a cross-laminated timber production facility in the city next to Imabari. Such facilities may be able to make use of smaller-diameter wood that is currently not commercial.

2.11. Partnerships

Three private-sector companies have adopted 206 ha of forest since 2007, providing funds for forest management activities. In return, these companies incorporate these corporate social responsibility activities into their public relations campaigns and use the forest for company events. These private-sector partnerships have created a multiplier effect, extending beyond the direct investment in forest management, as the companies actively raise public awareness about the importance of forest management.

2.12. Innovation, recognition and outreach

In 1995, the forest was recognized as one of the 100 exceptional watershed forests of Japan by the Ministry of Agriculture, Forestry and Fisheries for exhibiting an optimal relationship between forest and people in watershed protection (MAFF, undated).

From 1996 onwards, the forest cooperative (and now the city) has implemented an annual "forest experience class" with local elementary and middle schools. During these events, students learn about the history of forest management in Imabari, deepening their understanding of the benefits of the forest and the value of ongoing forest management. The city has also been collaborating with a local Rotary Club on annual forest maintenance and restoration activities, including rehabilitation of bamboo-infested areas. Citizens' forest awareness campaigns have also been organized periodically.

Local farmers, industries and city residents all benefit from ecosystem services provided

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[4] For more information please visit https://japancredit.go.jp/english/

by the forest, including mitigation of floods and other natural disasters, provision of recreational opportunities, climate amelioration, supply of clean water, pollination services, and agricultural pest management. These outreach efforts have improved awareness of and appreciation for the critical role that the city's watershed forest plays in underpinning the livelihoods and well-being of city residents.

3. KEY LESSONS LEARNED

The key success factor that enabled the continuation of forest management activities after the disbandment of the Imabari–Tamagawa–Asakura Forest Cooperative was the dedication and commitment of the staff from the cooperative who continued to look after the forest as city officials.

"We are passing on the legacy of forest management from the previous generation to the next", said Shinya Watanabe of Imabari's Agriculture, Forestry and Fisheries Division.

Partnerships with the private sector, local schools and civil society organizations, along with awareness campaigns, have had a positive impact, creating greater appreciation among city residents of the critical role that the watershed forest plays in mitigating disasters and ensuring clean and steady water supply for domestic, industrial and agricultural use.

4. FUTURE OUTLOOK

The city's population is expected to continue to decline, which will exacerbate the challenges associated with recruiting young foresters. Most forest owners, many of whom live away from the city, will remain uninterested in practicing forest management. However, recent regulations and policies described previously will enable the city to take over the management of fragmented smallholdings in need of interventions and ensure the availability of financial resources to conduct these activities. The challenge will be ensuring the availability of enough qualified forestry professionals to implement and coordinate forest management activities.

"There is strong hope that the Forest Management Administration System and the Forest Environment Tax will help us improve forest management and implement interventions where needed, particularly in forests that have been neglected for years", said Kenji Ochi of the Agriculture, Forestry and Fisheries Division, Imabari City.

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ASIA-PACIFIC

KALIBO MANGROVES: TURNING THE TIDE

Rowena Soriaga, Environmental Science for Social Change (ESSC), **Patrick Durst**, Forestry Consultant (formerly FAO Senior Forestry Officer), and **Jun Ariolo N. Aguirre**, Freelance Journalist

NAME OF FOREST	**Bakhawan Nature Study and Eco-Park (formerly Buswang Mangrove Plantations)**
LOCATION	**Barangays New Buswang, Old Buswang and Bakhaw Sur, Kalibo Municipality, Aklan Province, Panay Island, Western Visayas Region, Philippines**
AREA (ha)	**220**
MANAGING ENTITY	**Kalibo Save the Mangroves Association**
MANAGEMENT OBJECTIVES	**Mangrove rehabilitation; conservation; recreation**
FOREST TYPE	**Mangrove**

1. INTRODUCTION

This review builds on the previous FAO *In Search of Excellence* case study “Forest from the mud: the Kalibo experience” (Cadaweng and Aguirre, 2005) and captures key changes and developments over the past two decades.

For many decades prior to the mangrove plantation project initiated by the municipal government, the vast area of mudflats remained barren of vegetation. Elizabeth Ramos, a founding member of the managing entity, described it as an “open area of knee-deep mud”. Local historians say the area was once full of mangroves, but the trees had been cut down to make way for illegal fishing activities (Aguirre, 2020).

In 1990, 50 ha of mudflats near the Sooc River were selected as the principal site for mangrove rehabilitation. The Department of Environment and Natural Resources (DENR) awarded the municipal government (under then-Mayor Allen Quimpo) a USD 22 500 planting contract. The municipal government engaged a local NGO, United Services and Welfare Assistance Group, to mobilize nearby communities for the planting effort.

Initially, only 15 fisherfolk families from Barangays Old and New Buswang participated due to scepticism about payment. The NGO frontloaded the payment to the planters, which helped gain community trust and led to more participants joining the effort. In the end, 30 individuals planted over 222 000 propagules of Bakhawan lalaki (*Rhizophora apiculata*), Bakhawan babae (*Rhizophora mucronata*) and nypa palm (*Nypa fruticans*). Participants also protected the area from tree cutters and foraging animals.

By 1995, the survival rate of the seedlings was 97 percent. The people who contributed to this initial round of planting subsequently organized into a peoples’ organization: the Kalibo Save the Mangroves Association (KASAMA).

In 1995, additional planting expanded the mangrove plantation area to 70 ha. The extra 20 ha was made possible through a USD 4 200 grant from Quimpo’s Congressional District Fund to reforest seven more hectares, along with a second DENR contract covering an additional 13 ha.

The Bakhawan Eco-Park is a relatively small-scale mangrove rehabilitation initiative compared to others in the region. It is significant, however, in relation to the community and the local context of Panay Island, which has a total mangrove area of 25 000 ha. Its relevance is particularly noteworthy because Aklan Province was a hotspot for mangrove loss between 1996 and 2001.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

Mangrove rehabilitation, conservation and recreation remain the management objectives. Since 2005, there has also been increased emphasis on ecotourism.

2.2. Type and condition of forest and scale of operation

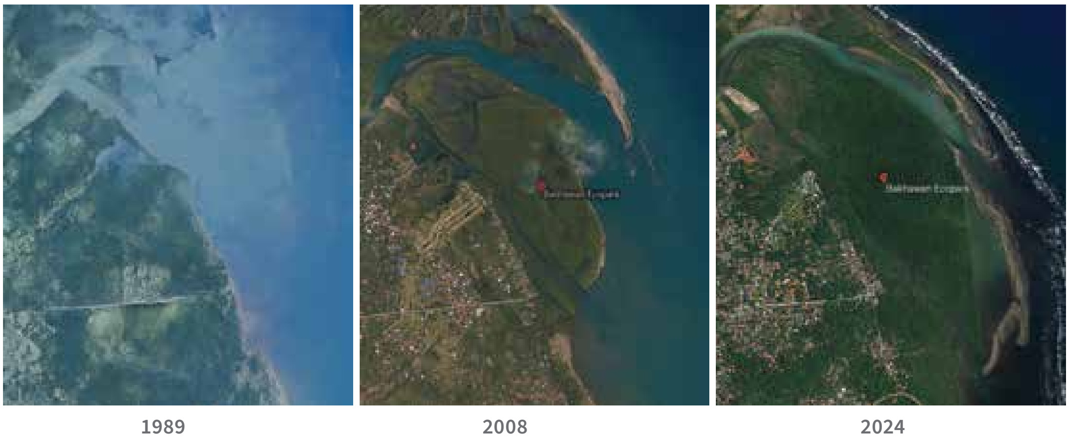
As of 2023, 220 ha in Kalibo have been planted or naturally regenerated with mangroves – more than doubling the 102.5 ha officially allocated to KASAMA under a Community-Based Forest Management Agreement (CBFMA) (**Figure 1**). This achievement also triples the area planted and protected at the time of the initial *In Search of Excellence* review conducted in 2005. This is impressive progress for a small NGO-driven effort, especially since it began on barren mudflats (Galing Pook, 1995; ESSC, 1999; Daquinan *et al*., 2023).

2.3. Legal status and management structure

The area of the Bakhawan Eco-Park is legally under the jurisdiction of the DENR, which conveyed tenure rights to the community under the CBFMA signed in December 2000 with KASAMA (**Figure 2**) (DENR and KASAMA, 2000). The CBFMA grants tenure rights for 25 years and outlines the responsibilities of KASAMA regarding forest protection, management and restoration. The CBFMA was expanded in May 2009 through a supplementary agreement, increasing the coverage from the initial 57 ha in 2000 to 102.5 ha (DENR and KASAMA, 2008). The CBFMA is scheduled to expire in December 2025, at which time it can be renewed for another 25 years.

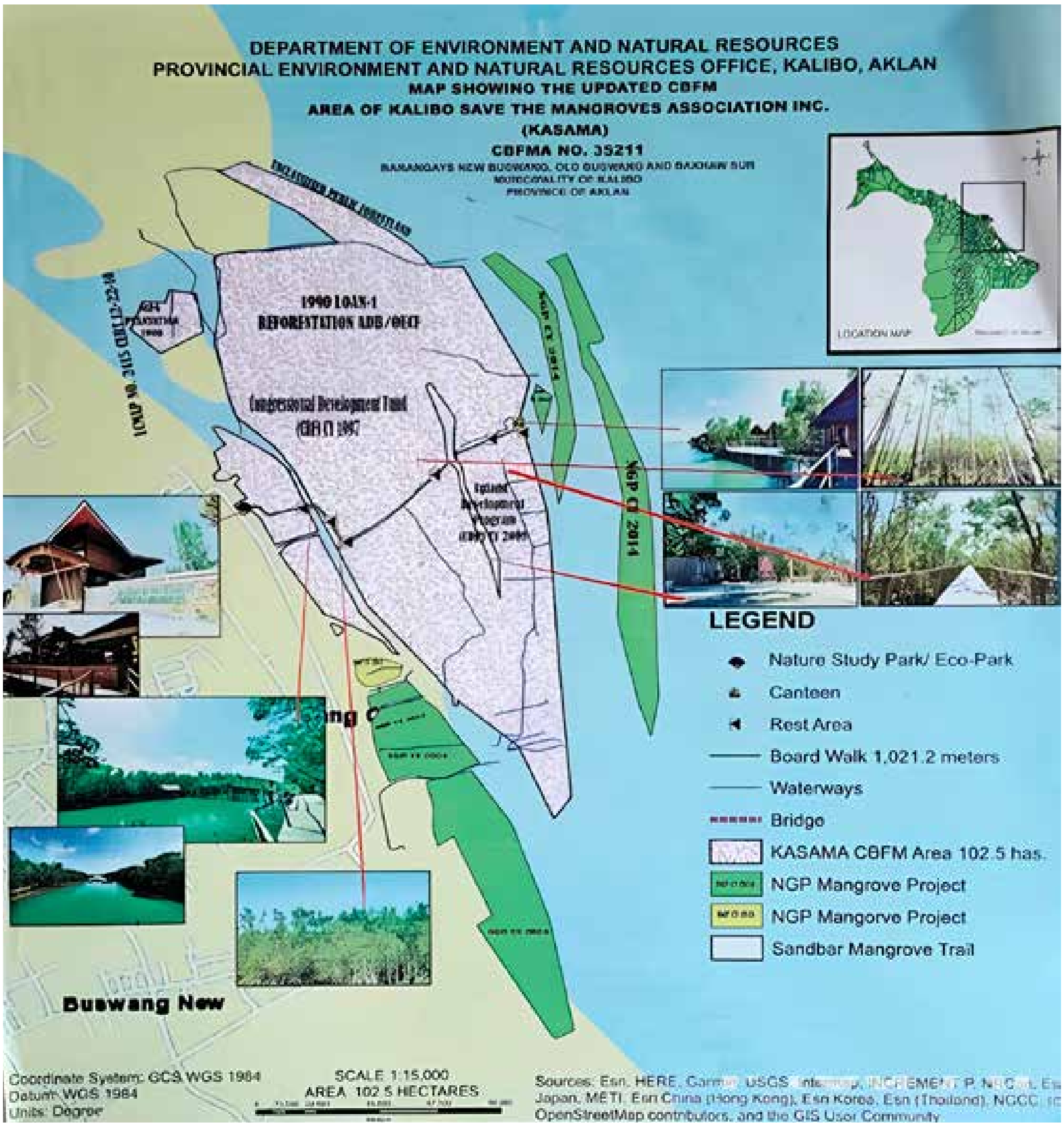
KASAMA's membership has grown from the original 28 members who formed the organization in 1990 to 204 members (104 men, 100 women) as of April 2023. The members, predominantly in their 40s, come from nine barangays (villages) in Kalibo Municipality and are involved in managing the mangrove forest and various aspects of their ecotourism enterprise.

Figure 1. *Development of mangroves at Bakhawan Nature Study and Eco-park, 1989–2022*



Source: Google. n.d. *Google Earth Pro*. [Cited 18 December 2024]. https://earth.google.com/web
Images: © Google Earth, 2024

Figure 2. *CBFMA agreed between DENR and KASAMA*


DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
PROVINCIAL ENVIRONMENT AND NATURAL RESOURCES OFFICE, KALIBO, AKLAN
MAP SHOWING THE UPDATED CBFM
AREA OF KALIBO SAVE THE MANGROVES ASSOCIATION INC.
(KASAMA)
CBFMA NO. 35211
PROVINCE OF AKLAN
1990 LOAN-1 REFORESTATION ADB/OECF
Congressional Development Fund (CDF) CY 1997
Upland Development Program (UDP) CY 2000
NGP CY 2014
LOCATION MAP
LEGEND
Nature Study Park/ Eco-Park
Canteen
Rest Area
Board Walk 1,021.2 meters
Waterways
Bridge
KASAMA CBFM Area 102.5 has.
NGP Mangrove Project
NGP Mangorve Project
Sandbar Mangrove Trail
Buswang New
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree
SCALE 1:15,000
AREA 102.5 HECTARES

Source: DENR and KASAMA. 2000. Community-Based Forest Management Agreement. Quezon City, Philippines.

When they first started planting mangroves, the motivation for the group was to improve ecosystem services. But, because of their dramatic success in establishing and expanding the mangroves, the area became an ecotourism attraction branded as the Bakhawan Nature Study and Eco-Park. Now KASAMA runs four operational units: Forestry, Education, Livelihoods and Tourism. The Forestry Unit protects mangroves – not only within the CBFMA area for which they are formally responsible but also in the surrounding area, covering the entire 220 ha extent of mangrove forests in Kalibo Municipality. An 18-member team, known as the “eco-police”, protects the mangrove forest from encroachment and illegal activities. The salaries of eco-police members are paid by the provincial government. The Tourism Unit of KASAMA oversees Eco-Park entrance-fee collection, souvenir sales and cafe operations.

KASAMA has a Board of Directors composed of seven members. The people’s organization holds board elections every two years and elected board members serve staggered terms of four years.

BAKHAWAN
NATURE STUDY
& ECO-PARK
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Entrance to Bakhawan Nature Study and Eco-Park

2.4. Regulatory environment and government support

The regulatory environment for mangroves has remained unchanged since the early 2000s. Clearcutting of mangrove species is still prohibited, with subsequent policies reinforcing this ban (DENR, 1990). In 2022, for example, Department Order No. 05 was issued to regulate wood charcoal production and reinforce the ban on cutting mangrove forests (DENR, 2022).

The DENR's support has been consistent, with the assigned site coordinator from the DENR provincial office providing over two decades of technical, administrative and moral support and assistance. This level of sustained support is exceptional, given the DENR's usual practice of regularly relocating staff. Stationed near the mangrove area and based in the DENR office at the Bakhawan Eco-Park, the coordinator plays a crucial role in managing the mangrove forest. Her responsibilities include selecting planting areas and species, documenting management practices and outcomes, and educating visitors on sustainable forest management.

With consistent DENR accompaniment, KASAMA has an updated Community Resource Management Framework that lays out the community forest management plan for 2025 (KASAMA, 2020). This framework has helped garner strong support from the executive and legislative branches of the government. Notably, KASAMA received contracts from the National Greening Program in 2011 and 2014, which provided funds to expand the mangrove area.

Additionally, the DENR central office granted KASAMA a special permit for briquette production using materials from thinning operations in areas where trees had been planted too densely. Unfortunately, this initiative was discontinued in 2008 after Typhoon Fengshen (Frank) destroyed the briquette production equipment.

In addition to contractually hiring eco-police personnel for the Bakhawan Eco-Park, the Provincial Government of Aklan is a key party to a tripartite agreement with KASAMA and the Korea International Cooperation Agency (KOICA) for an eco-friendly aquaculture value chain project. In 2017, the project established a seafood processing facility adjacent to the mangrove area.

The Municipal Government of Kalibo has included mangrove reforestation in its Comprehensive Land Use Plan, its Disaster Risk Reduction and Management Plan, and its Local Climate Change Adaptation Plan. In addition, the Provincial and Municipal Tourism Offices actively promote the Bakhawan Eco-Park by distributing brochures at the Kalibo Airport information desk and by training tricycle drivers to highlight Kalibo's tourist attractions, including the mangroves.

High-level national support comes from both the Senate and Congress. Senator Loren Legarda secured federal funding for the construction of a Philippine peso (PHP) 16 million (USD 300 000) building at the Bakhawan Eco-Park and regularly promotes the Kalibo mangroves through online events (Climate Change Commission, 2020). In Congress, legislative bills have been filed since 2016 to declare the Bakhawan Eco-Park in Kalibo as an ecotourism zone so that funds can be more easily appropriated (The Philippines, 2022).

2.5. Forest management practices

Mangrove restoration approaches have evolved, expanding from planting just three species to now cultivating and tending at least 23 species. There is also now increased recognition of the potential for natural regeneration. The DENR provides technical guidance on areas to be planted.

> *"Before, we planted only Bakhawan species. But after planting the Bakhawan [in our initial area of 50 ha], other species of mangroves grew naturally, like pagatpat (*Sonneratia *sp.) and piapi (*Avicennia alba*)."*
> – Elizabeth Ramos, KASAMA founding member

Nursery management mainly follows a backyard approach, where families operate their own small nurseries near their houses and supply propagules to the association. This approach has enabled women to participate in nursery management and to earn income from it.

Monitoring and protection have improved over the years, evolving from informal patrols by KASAMA members to the establishment of the current eco-police of 18 paid staff, funded through the provincial budget. To address the problem of cattle grazing on young plantations of Rhizophora, the municipal government passed a local ordinance that strengthened community regulations by imposing fines on violators.

Management of insect infestations, such as those caused by tussock moths (*Lymantriinae* spp.), has evolved from ineffective methods like spraying chili mixed with gasoline to a more effective system. This system incentivizes association members to manually collect moth larvae, offering them PHP 10 (USD 0.20) per kilogram of larvae collected and disposed of.

©ROWENA SORIAGA/ESSC

Backyard nursery of Elizabeth "Zabeth" Ramos, one of the original KAWAMA->KASAMA planters

Silvicultural practices include “cleaning” or thinning areas that were planted too densely. Salvage harvesting was also applied to trees that were downed or damaged by typhoons.

With support from DENR, KASAMA has updated its forest management plan for 2020 to 2025 through a participatory planning process. The association has also conducted post-disaster assessments in their communities and in the mangrove areas.

2.6. Production and business aspects

Over the past eight years (2015–2022), managing mangroves has generated approximately PHP 10 million (USD 201 000) in revenue for KASAMA, averaging about USD 25 000 annually (KASAMA, 2022). The Eco-Park income contributes 80 percent of this total revenue, primarily through entrance fees from tourists visiting the boardwalk and other facilities (**Figure 3**).

A three-tiered fee system is applied at Eco-Park, where visiting students, senior citizens and people with disabilities pay PHP 40 (USD 0.80), Aklanons pay PHP 60 (USD 1.20) and visitors from outside Aklan, including international visitors, are charged PHP 120 (USD 2.40). From 2020 to 2022, the park received over 43 000 visitors, most of them (98 percent) coming from within the country (**Figure 4**). As of July 2023, TripAdvisor ranked Bakhawan Eco-Park as the top tourist destination in Kalibo.

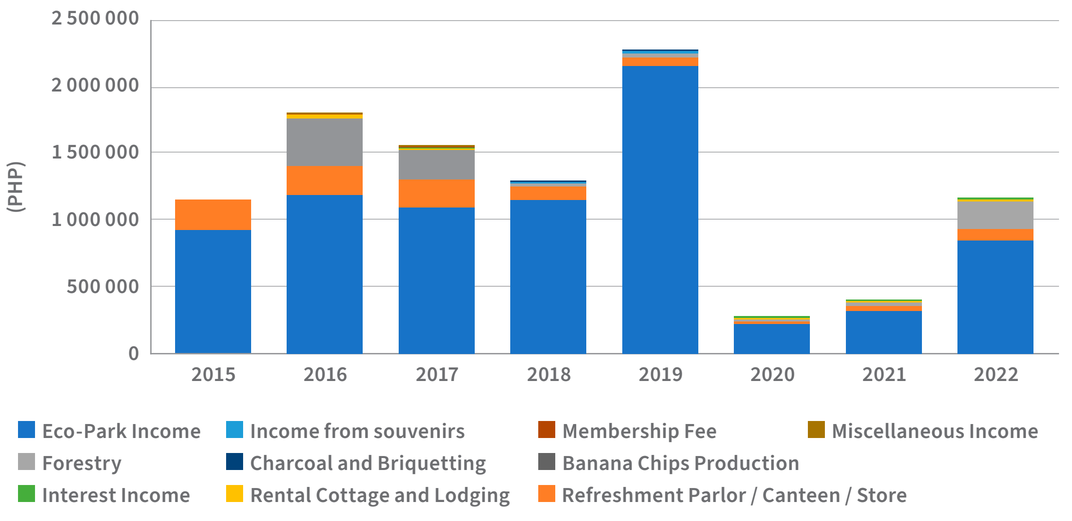
Over the past eight years, additional notable income has come from the park’s café and from forestry operations, representing 10 percent and 9 percent of gross revenues, respectively. Forestry income totalled almost PHP 900 000 (approximately USD 18 000), coming mainly from sales of propagules.

In recent years, half of the total expenses went to Bakhawan Eco-Park staff salaries (39 percent) and repairs and maintenance (11 percent). The other half was spent on events and training, forestry operations, electricity, water, communications, taxes and licenses, and other expenses.

Considerable effort and financial resources were invested to build and maintain the 1.2-km boardwalk, which is a key element of the ecotourism experience at the Eco-Park.

The cold storage facility for seafood products beside the Bakhawan Eco-Park Center opened in 2017 with support from KOICA. The facility employs around 20 members. From this facility, KASAMA anticipates a future inflow of monthly rental income.

Figure 3. *KASAMA income sources, 2015–2022*



Source: KASAMA. 2022. *Audited Financial Statements 2016–2022.*

©PATRICK DURST

A boardwalk through the mangroves

Kalibo Save the Mangroves Association has an exemplary track record among people's organizations in the Philippines with regard to financial accountability and transparency, as evidenced by its updated and audited financial statements.

2.7. Social aspects and impacts

> *"Our success in turning the tides, so to speak, is in making a story and making people matter. We always say – every time you plant, you become an owner of this forest and we hope you have good memories of this forest, and that your children would still want to be here."*
> – Angelo Quimpo, President, KASAMA

The KASAMA community has relatively good access to basic social services, and many of its members are well educated, with 70 percent having a college education (KASAMA, 2020). The leadership is both knowledgeable and highly skilled in organizational management. Over the past eight years, training has been the association's third largest expense. Active participation of women is evident in all undertakings.

Local residents are allowed to catch mud clams (*Geloina striata*) and crabs from the mangrove forest, and KASAMA now has a system for monitoring the amounts caught. Young people often sell their catch to earn money for schooling. Crabs sell for PHP 350/kg (USD 7), and an individual can catch around 3 kg per day. The mangrove forest became a safety net for local people at the height of the COVID-19 pandemic when mobility was restricted and jobs were scarce, providing a source of food, fuelwood and income.

Benefit-sharing for nursery operations is 60 percent for members and 40 percent for the organization. For example, for every propagule sold at PHP 5 (USD 0.10), the member who grew the propagule receives PHP 3 (USD 0.06), and PHP 2 (USD .04) is contributed to the organization. A potted propagule sells for PHP 15 (USD 0.30).

2.8. Environmental values and impacts

The role of the Kalibo mangrove forest in mitigating disaster risks is now well recognized, especially as it relates to coastal protection during typhoons (Business Mirror, 2017; Duncan *et al.*, 2016; Municipality of Kalibo, 2017).

The Head of the Disaster Risk Reduction and Management Office reported that a post-disaster assessment in the area, conducted by Canadians after Super Typhoon Haiyan, revealed that houses shielded by the mangroves from strong winds and storm surges suffered less damage than those in coastal areas without mangrove protection. In response, Kalibo's Disaster Risk Reduction and Management Plan now calls for mangrove rehabilitation in typhoon-damaged areas (Municipality of Kalibo, 2022). Additionally, a new subdivision built near the Bakhawan Eco-Park is marketing its properties as "flood-free".

According to the DENR mangrove site coordinator, biodiversity assessments conducted in the 1990s found 19 mangrove and beach forest species, 28 species of birds, and 33 species of moths (Quadra, 2023). The numbers and diversity of species are likely to have increased as the forest has expanded. Local residents report an increased abundance of clams, crabs and fish.

An assessment of carbon sequestration has been conducted under the Japan International Cooperation Agency-supported Blue CARES Project (Comprehensive Assessment and Conservation of Blue Carbon Ecosystems and Their Services in the Coral Triangle). However, this evaluation focused solely on carbon stored in the mangrove sediments and did not account for carbon in the biomass or trees (Ray *et al*., 2023; San Diego-McGlone and Quiros, 2022). A separate study by Raga-as *et al*. (2022) estimated the monetary value of Kalibo's carbon stocks at PHP 2.9 million (USD 58 000).

2.9. Challenges and threats

Recent extreme weather events, including Tropical Storms Fengshen in 2008, Haiyan in 2013 and Rai in 2021, transported large amounts of sediment from the Aklan uplands. This sediment is no longer compatible with the mangrove species in the area. As an adaptive measure, DENR now encourages planting mangrove species suited to the type and condition of substrate in the target areas. In response, KASAMA is also diversifying the range of mangrove species being planted.

A researcher from Aklan State University reported that satellite images analyses (Paringit and Sinogaya, 2017) revealed a connection between sediment accretion in the Kalibo mangrove area and the erosion of the shoreline in New Washington, the neighbouring municipality downstream (Yoshikai *et al*., 2023a; Yoshikai *et al*., 2023b). She urged KASAMA to stop planting mangroves along the Kalibo coastline and instead grow seedlings and wildlings to supply other municipalities. At the Aklan River, Bay and Coast Summit in January 2023, the researcher indicated that the flooding problems in downtown Kalibo were being exacerbated by the Kalibo mangrove area (BNFM Kalibo, 2023).

Most hydrologists and ecologists recognize that flooding is a complex problem that cannot easily be attributed to only one of several interacting factors. Officials from KASAMA and DENR believe it is risky to oversimplify the issue without considering the broader watershed landscape and infrastructure challenges (e.g. drainage obstructions). They urge further dialogue that brings together multiple stakeholders in the watershed to help unpack this complexity and move towards a collaborative landscape governance mechanism.

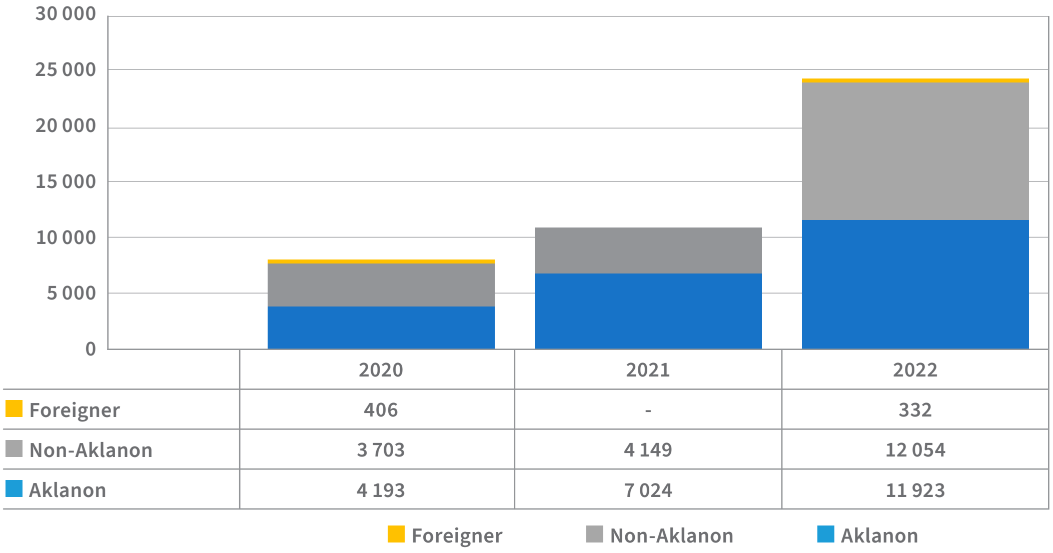
The current tenure agreement of KASAMA is set to expire in 2025, and the KASAMA President is cautious about renewing the agreement due to various challenges encountered. For example, KASAMA used to earn income from kayaking, but this was halted because of conflicts with the businessperson with whom they had partnered. Although KASAMA eventually prevailed in the court case, the legal fees negatively affected their net income.

2.10. Opportunities

The Bakhawan Eco-Park facility generates income from entrance fees, consigned souvenirs, café operations and the edible tamilok wood-worm (*Teredinidae*) demonstrations, while also providing employment to 17 members. Impressively, the park received 25 000 visitors in 2022, even though pandemic restrictions had not yet been fully lifted. With more promotion, these numbers could easily grow, drawing in additional livelihood and income-generating opportunities. For example, locally produced souvenirs reflecting the local context could increase community income.

With the impending expiry of the CBFMA, other entities are showing interest in taking over management of the area, largely because of the ecotourism opportunities generated by the mangrove forests and their supporting facilities.

Figure 4. *Bakhawan Eco-Park visitors, 2020–2022*



	2020	2021	2022
🟨 Foreigner	406	-	332
■ Non-Aklanon	3 703	4 149	12 054
🟦 Aklanon	4 193	7 024	11 923

Source: KASAMA. 2022. *Audited Financial Statements 2016–2022.*

Although Quimpo, the original advocate for mangrove rehabilitation in Kalibo, passed away in 2016, the values he instilled live on with the current leaders, who continue nurturing the relationships that grew alongside the mangroves. His son, Angelo, was elected KASAMA President in 2016 and, with his experience in business and organizational management, he has improved the association's organizational systems and financial status. As concurrent president of the Northwestern Visayas Colleges, which has 6 000 students, Angelo has a tremendous capacity to inspire and influence the next generation in Aklan. Many students have planted mangroves as part of their research, civic education or on-the-job training and therefore feel a sense of connection and stake in mangrove protection and management.

The DENR site coordinator, who has been working with KASAMA for 33 years, sees herself continuing as a member and technical adviser after her retirement since she lives near the mangrove forest.

Elizabeth Ramos, one of the first planters and now a KASAMA Board of Trustees member, has a daughter who graduated from ocean studies and a son-in-law working with the Southeast Asian Fisheries Development Center. This highlights how the next generation of KASAMA members have enhanced skills and networks that can contribute to securing the future of mangroves in Kalibo.

2.11. Partnerships

The relationship between KASAMA and DENR is strong and enduring, which is exceptional. In many other areas, there is tension between forest resource users and the forestry agency because of the latter's regulatory functions, but this is not the case in Kalibo.

Other partners of KASAMA come from various sectors (*Daily Guardian*, 2015; *Panay News*, 2016), including corporate social responsibility programmes (e.g. One Meralco Foundation), religious groups (e.g. Iglesia Ni Cristo) and the education sector.

The organization KASAMA is well connected with local and national governments and has demonstrated an outstanding ability to garner backing from diverse partners. The current Kalibo Municipal Mayor is highly supportive, and the KASAMA Board Committee Vice-Chairman is also an elected municipal councillor. National-level politicians have consistently supported the Bakhawan Eco-Park.

2.12. Innovation, recognition and outreach

In 1989, the Kalibo mangrove area became the second of 30 “Mangrove Eco-Parks” to be established in the Philippines (Primavera and Savaris, 2022). The site has since become a model and demonstration site for replication and scaling to other coastal municipalities, including Talisay City, Negros Occidental and Malolos, Bulacan. Through the years, the Bakhawan Eco-Park has inspired many others to develop and manage mangroves in their own barangays. In 2018, the Eco-Park hosted Ms. Earth contestants, helping to build public awareness and strengthen advocacy for sustainable mangrove management.

Local actors view the inclusion of their site in the FAO *In Search of Excellence* publication (Cadaweng and Aguirre, 2005) as an award recognizing their efforts. Since 2005, the site has been recognized with several other social and environmental awards, including “Best Practice in the Implementation of the Philippine Population Management Program” (2012), “Best CBFM People’s Organization in Aklan” (2018) and the Department of Tourism’s award for “sustainable development of ecotourism in Western Visayas” (2023). The Kalibo Municipal Government also won the KALIGKASAN Award for “Best Local Government Unit Climate Change Mitigation and Adaptation Project”.

3. KEY LESSONS LEARNED

- **A positive and continuous relationship between the forest department and the local community is a key element contributing to sustainable management of forests.** Continuous partnership between DENR and KASAMA helped to build trust, which in turn facilitated the expansion of the mangrove forest and improved management. Ensuring proper handover and continuity of relationships over time helps maintain trust between government actors and the local community.
- **Forests need committed champions to survive and thrive.** The memory of the late Allen Quimpo, who began mangrove restoration in the area, still drives the stories, motivations and actions of current members of the association. Despite the challenges, many members remain inspired to continue managing the mangroves.
- **A mission statement that is simple and clear enables uptake and buy-in.** The mission statement of KASAMA is simply “plant, plant, plant”.
- **More robust evidence is needed on the role of mangroves in landscape-level management and disaster risk reduction.** Much is already known about the role of mangroves in protecting coastlines and providing a buffer against strong winds and storm surges. However, more robust evidence is needed in terms of the interaction of mangroves with other ecosystem services.
- **In nursery management, trade-offs exist between efficiency and equity.** KASAMA’s backyard approach to nursery management, wherein families look after small nurseries with relatively few seedlings, is arguably less efficient than operating larger nurseries with professional managers to attain economies of scale. A backyard approach to nursery management requires more upfront investments to train families in effective nursery management but benefits the community by fostering a more equitable distribution of benefits.
- **Visibility provides motivation for people to maintain momentum and action.** The FAO *In Search of Excellence* recognition helped generate visibility for KASAMA, leading them to win awards and secure additional partners. Success breeds success.

4. FUTURE OUTLOOK

The 220-ha mangrove forest in Kalibo is likely to be sustained and not converted to other land uses over the next generation. The political and regulatory environment is supportive of its protection and sustainable management. The community association is a strong institution with a tested governance mechanism, capable leaders, committed members and a track record of attracting projects and funding.

The previous trend of expansion of the mangrove area may slow or even stop because of questions emerging from academia about the value of additional planting, triggered by flooding incidents in Kalibo town proper. The complexity of this issue warrants further investigation, which will hopefully result in clearer guidance on future planting (i.e. clarity on site–species matching and best locations for mangrove expansion).

The new facilities of the Bakhawan Eco-Park can spawn many potential new and innovative revenue streams. The continuing stream of projects indicates that the local managers have a reputation for delivering positive results. They may feel weary at times because of trials that come their way, but their determination, resilience and strong social processes have helped them overcome numerous challenges. Members of KASAMA are rightfully proud of what they have accomplished and how they have contributed to society and the local community. This strength and spirit are likely to continue to serve as the basis for continued success in the years to come.

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ASIA-PACIFIC

UNLOCKING THE POTENTIAL: TURNING RIGHTS INTO LIVELIHOODS IN KAMPONG PHLUK, CAMBODIA

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NAME OF FOREST	**Kampong Phluk**
LOCATION	**Kampong Phluk commune, Prasat Bakong district, Siem Reap province, Cambodia**
AREA (ha)	**12 033 (including 214 of flooded forest and 165 of restoration area)**
MANAGING ENTITY	**Kampong Phluk Community Fisheries Management Committee**
MANAGEMENT OBJECTIVES	**Conservation of aquatic biodiversity; sustainable management and use of flooded forest resources and services for improved livelihood; mitigation of natural and anthropogenic disasters**
FOREST TYPE	**Natural and planted flooded forest**

1. INTRODUCTION

Kampong Phluk (also known as Kompong Phluk) community fisheries (CFi) is located on the edge of the Tonle Sap Great Lake in Kampong Phluk commune, Prasat Bakong district, Siem Reap province in Cambodia. The commune consists of three villages – Dey Krahom, Kork Kdal and Tnout Kambot.

As early as the 1940s, Kampong Phluk villagers began managing and protecting the flooded forests from the expansion of agricultural activities (Evans *et al.*, 2004). In 1998, Kampong Phluk village leaders requested FAO, through its project Participatory Natural Resource Management in the Tonle Sap Region, and the Siem Reap provincial fisheries office to assist them in establishing a community forestry organization. In 2001, the Kampong Phluk community forestry organization was restructured and registered as Kampong Phluk CFi with an elected management committee (CFiMC). This change reflected the Kampong Phluk community's dependence on and rights over the open water area and fishery resources. The provincial governor approved the CFi's rules and regulations the same year, granting the community management rights over the flooded forest and the open lake. The first CFi management plan (CFiMP) was developed for 1999–2002, and subsequent CFiMPs were developed every three years.

The following sections analyse major changes and developments in Kampong Phluk CFi over the past 20 years, updating the previous *In Search of Excellence* case study "Kompong Phluk and Bos Thom communities: asserting local rights" (Marschke, 2005).

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

Kampong Phluk CFi maintains management objectives that focus on the conservation of aquatic biodiversity, sustainable management and use of flooded forest resources for improved livelihoods, and the mitigation of natural and anthropogenic disasters. These management objectives require the CFiMC and its members to be accountable and involved in a broad range of protection, regeneration and income-generation activities.

2.2. Type and condition of forest and scale of operation

The CFi site in Kampong Phluk is 12 033 ha, which is 3 169 ha larger than previously reported in Marschke (2005), since the open lake area has been included in the CFiMP.

The latest CFiMP (2023–2026) for Kampong Phluk identifies the following management blocks of the CFi area:

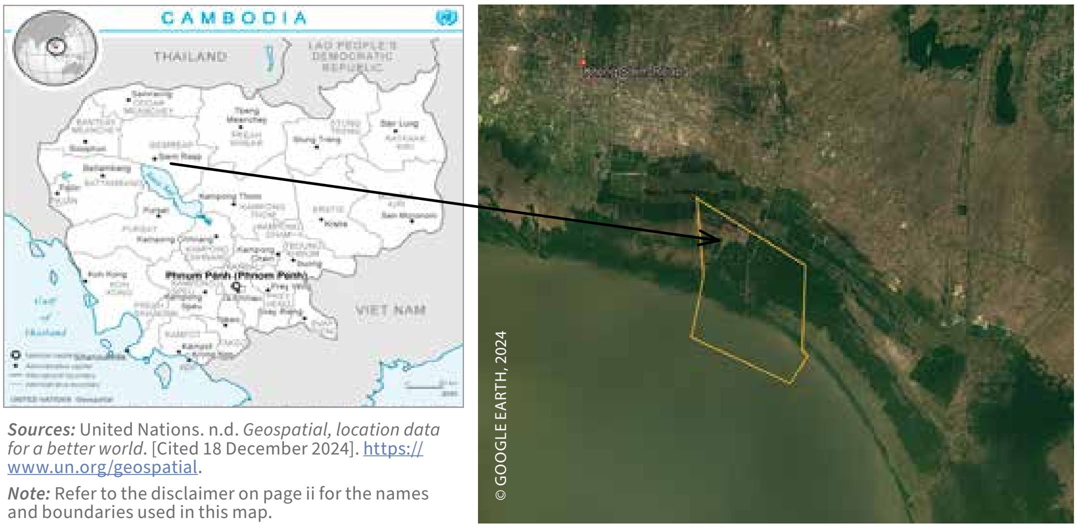
- Open lake: 6 000 ha
- Fish conservation zones (two blocks, part of the Tonle Sap Lake): 205 ha
- Flooded forest conservation zones (two blocks): 214 ha
- Grassland areas (two blocks): 43 ha
- Restoration areas (two blocks) from forest fire and clearance by agricultural activities: 165 ha
- Settlement land: 44 ha
- Pond and streams: 5 415 ha

Although the CFiMP concludes that the total CFi area is 12 033 ha, aggregation of the management blocks results in 12 085 ha. This is a technical error that occurred during the development of the management plan and must be corrected in the next plan.

Since registering as a CFi in 2001, the Kampong Phluk CFi area has remained the same to this day. While the CFi area is unchanged, the flooded forest resources and fish population have declined dramatically. The villagers have noticed losses of large trees in the flooded forest due to forest fires and illegal logging. They have also observed a reduction in fish numbers, attributed to the loss of flooded forest habitat, low water levels in the fish-spawning areas, in increase in fishers from other villages and the use of illegal fishing gear.

During the flood season, fish deposit their eggs in the flooded forest, a habitat that provides natural protection. This environment shields the eggs from predators and prevents them from being harvested by humans. In contrast, laying eggs in open lakes or shallow waters exposes them to greater risks, including predation and human interference.

Figure 1. *Kampong Phluk location*



Sources: United Nations. n.d. *Geospatial, location data for a better world*. [Cited 18 December 2024]. https://www.un.org/geospatial.

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

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2.3. Legal status and management structure

The Kampong Phluk CFi has a formal management agreement with the fisheries administration cantonment that grants management rights to CFi users. The management agreement does not allow the community to sell, exchange, rent, donate, share, divide, borrow, pawn or transfer the CFi area in any form. The government technical agencies supporting CFi's operation in Kampong Phluk include the Fisheries Administration Cantonment of Siem Reap Provincial Department of Agriculture, Forestry, and Fisheries and local authorities at commune, district and provincial levels.

Kampong Phluk community has been managing their CFi sites by adhering to their CFi regulations and management plan, which have served as the foundation for the CFi's development. The CFiMC consists of 13 members, including a chief, two deputy chiefs, a secretary, a cashier, a patrolling team leader, and seven other members. The committee's structure has been expanded to accommodate their increased responsibilities in overseeing a larger and multiple-use CFi area.

2.4. Regulatory environment and government support

The legal framework in Cambodia provides the foundation for operating and managing CFis effectively, in particular the Fisheries Law (2003), the Sub-decree on CFi Management (2005) and Prakas on the Community Fisheries Guidelines (2007). These legal instruments outline the rules and procedures for establishing and managing CFis. Additionally, the sub-decree clearly defines the communities' and government institutions' roles and responsibilities in managing these fisheries.

Kampong Phluk CFi is also well in line with the commune development priorities, which are local development frameworks that form part of the decentralization process in Cambodia. The CFiMP activities are integrated into the five-year commune development plan in Kampong Phluk commune (2023–2027).

Kampong Phluk CFi works closely with the district fisheries administration to plant trees, patrol the CFi area, manage fire and develop management plans. However, because human resources are limited, the district fisheries administration must rely on the Kampong Phluk community committee and members for regular patrolling to manage and protect the flooded forest.

2.5. Forest management practices

Since the CFi's establishment, Kampong Phluk villagers have been aligning their forest management practices with the objectives of the CFiMP, adapting to both challenges and opportunities. Over the past 20 years, Kampong Phluk CFi has focused on protecting the trees in the flooded forest around the village as fish spawning ground. However, it was only after experiencing severe impacts from floods and forest fires around a decade ago that community members started embracing and implementing flooded forest restoration activities. The forest management practices are listed in **Table 1** below.

Table 1. *Forest management practices in Kampong Phluk*

CONSERVATION FOR AQUATIC BIODIVERSITY	SUSTAINABLE MANAGEMENT AND USE
• Maintaining dedicated area for fish conservation • Restoring flooded forests by planting trees from stem cuttings and seeds • Extracting listed tree species for firewood (1 m^3/household/year) • Managing waste	• Patrolling and reporting illegal encroachment and forest fire incidents to the Fishery Administration and local authorities • Managing natural firebreak • Using sustainable fishing equipment and practices, for instance avoiding the electric shock technique to catch fish

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Fishing near flooded forest in Kampong Phluk

Kampong Phluk has successfully managed waste to safeguard its flooded forests from pollution and enhance its appeal to tourists. These efforts include promoting awareness, regularly collecting waste, and sorting waste disposed of upstream. Additionally, the village organizes an annual campaign each December to collect waste along the main stream. At the household level, villagers segregate plastic and kitchen waste. Kampong Phluk has become a well-known destination for other communities seeking to learn about waste management.

The CFiMC regularly reports instances of illegal encroachment and forest fires to the Fisheries Administration (FiA) and local authorities during their monthly commune meetings. If such incidents occur within the CFi, the CFi committees immediately visit the sites to stop the offenders by negotiating, confiscating illegal equipment and asking the intruders to sign agreements to stop illegal activities within the community area. They also seek intervention from local authorities and FiA officials. In serious cases, the FiA may assign officers to support the community or bring the case to court.

In recent years, there has been an increase in forest fires caused by outsiders smoking out beehives, dropping cigarette butts or cooking while fishing or grazing livestock in the area. To address this, the CFi has now established a dedicated forest fire patrolling group to monitor, detect and report incidents to the authorities. The group is equipped with firefighting equipment and can contact the provincial forest firefighting network for additional personnel and equipment when needed.

2.6. Production and business aspects

Most villagers continue to rely on fishing for both income and consumption. However, they express concerns about the rising cost of fishing, mainly from the increased cost of petrol, which often forces fishers to borrow from wholesalers and later repay in harvested fish. In the past, when fish stocks were abundant, they had enough to feed their families and share with their neighbours. Recently, however, the declining fish stock has made it difficult for fishers to secure sufficient catch for both home consumption and sale in the market.

Apart from fishing, community-based ecotourism has become an important source of income for Kampong Phluk's villagers, particularly for women, who have been empowered by participating in the ecotourism group and making decisions for group operations and benefit sharing. Ecotourism has created opportunities for women to earn income through rowing boats, cooking and processing products for tourists.

The number of ecotourism members grew from 50 families in 2010 to 998 as of 2023. A portion of the earnings from ecotourism contributes to protecting and conserving flooded forests, fish and aquatic species. Women row wooden boats to take tourists on excursions inside the flooded forests, while men drive motorboats to transport tourists to the open lake.

The service charge of USD 5 for taking a wooden boat to visit the flooded forest area is distributed as follows: USD 2 for wooden boat paddlers; USD 2 for boat drivers; and USD 1 for the community ecotourism group to support forest patrolling and prevent illegal activities. Before the COVID-19 pandemic, women boat paddlers could earn up to USD 1 000 during the high season from September to December. Their income has decreased by 70 to 80 percent since the pandemic.

The villagers have attempted to diversify their livelihood options to agricultural activities to reduce their dependence on fish from the flooded forest. During the dry season, the villagers raise chickens and grow vegetables.

2.7. Social aspects and impacts

The Kampong Phluk community has a strong sense of coherence, passed down through generations. The villagers have not had new immigrants, allowing them to share and preserve the same cultures, religions and recognition of the importance of CFi management, including the open lake.

Stilt houses in Kampong Phluk

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A total of 998 families (3 825 people, of whom 1 934 are women) from three villages – Dey Krahom, Kork Kdal and Tnout Kambot – participate in resource management in Kampong Phluk. The entire population in Kampong Phluk is Khmer by ethnicity and Buddhist by religion. The villagers live in permanent stilt houses in the village. They move out to the open lake during the dry season in their temporary floating houses to conduct fishing activities and return to their villages as the lake's water rises, generally in June.

The CFiMC has expressed concerns about the younger generation's lack of interest in participating in CFi activities or joining its committee. Some young people prefer to pursue other income-generating activities, such as fishing or driving motorboats for tourists. The CFiMC realizes its responsibility to raise awareness among the youth about the importance of the CFi in protecting flooded forests and fishery resources, which ultimately contribute to income generation.

Over the last 20 years, development projects have improved the village's road access, opening opportunities for ecotourism development. Schools, health centres and pagodas have also been built to improve local literacy rates, health and religious practices. However, the village still does not have access to clean, running water. The villagers rely on Tonle Sap Lake for household use but drink bottled water.

The villagers continue to collect wild vegetables, medicinal plants and firewood from the flooded forests, although fuelwood is now collected in smaller amounts because ofthe increasing use of gas and electric stoves.

2.8. Environmental values and impacts

The people of Kampong Phluk greatly appreciate the flooded forests since they protect the community from harsh weather conditions, such as storms and floods, and provide an aquatic home for fish.

Additionally, the flooded forests provide ecosystem services that support ecotourism development, contributing to the local community's livelihood. Each household participating in ecotourism activities is asked to collect 4 kg of seed for community tree plantation efforts, thus contributing to forest restoration and biodiversity conservation.

However, there are some negative environmental impacts. According to a survey conducted by Kry *et al.* (2020), Kampong Phluk villagers have

Fishing in Kampong Phluk

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Boat dock in Kampong Phluk

complained about the noise and air pollution caused by the growing use of motorboats for tourism. The noise levels disturb the fish, which can make fishing more challenging.

Additionally, the CFiMC has expressed concerns over the fluctuating water levels, which also affect the fish population, especially during the irregular rainy season. Dang *et al.* (2022) indicate that the Mekong River dams have altered the hydrologic balance and inundation dynamics of the Tonle Sap Lake and reduced the annual inflow volume into the lake.

Finally, the disposal of household waste from upstream areas has caused water pollution and environmental hygiene issues in the flooded forests and Tonle Sap Lake. To address this problem, the community has launched campaigns to raise awareness and promote better waste management, particularly waste segregation and recycling.

2.9. Challenges and threats

The Kampong Phluk CFi is facing a variety of challenges related to natural, human, physical and financial capital.

Regarding natural capital, the decline in fish populations and catch sizes is a major concern for the villagers, as fishing is their primary source of income. They work diligently to prevent the use of harmful fishing equipment by neighbouring villagers. Since the fishing area is open, Kampong Phluk villagers must share the fish resources with a growing number of outsider fishers.

The villagers find it difficult to prevent pesticides from upstream areas from flowing downstream to their flooded forest area and the lake, harming their ecosystems.

Forest clearance and fires have occurred because of illegal encroachment by neighbouring villages, particularly during the dry season, for farming and grazing activities. Since the local authorities and fisheries officials mapped out the farming plots in 2022, villagers now face the challenge of preventing the expansion of existing farmland inside their flooded forest.

Regarding human capital, the members of the CFi must balance their livelihood activities for their families with their community-related responsibilities. Unfortunately, the FiA has limited human resources and cannot promptly intervene when there is illegal encroachment and forest fires in the Kampong Phluk CFi area. As a result, CFi members are left to take proactive measures onsite.

An additional challenge is the younger generation's lack of participation in CFiMC. The current members have been serving for nearly 20 years. They understand the importance of preserving and enhancing the social, environmental and economic values of the flooded forests, but they need new generations to continue this commitment into the future.

Regarding physical capital, the Kampong Phluk community lacks the necessary resources to prevent the spread of fires during the dry season. They need additional hand trucks for transporting water to firefighting sites. The villagers detect forest fires from smoke, but by the time the smoke is visible, the fires have often already spread. The community hopes to adopt technology that can enable earlier detection of fires.

Financially, the Kampong Phluk community is at risk because of its heavy reliance on fisheries as a source of income, particularly given the decreasing fish catch volumes. While community-based ecotourism shows promise, it is not yet sufficiently developed to provide sustainable livelihoods for the locals. Moreover, ecotourism in Kampong Phluk has been adversely affected by a lack of water and boat access during the dry season, as well as lower water levels during the rainy season.

2.10. Opportunities

The opportunities for Kampong Phluk CFi can be grouped into four categories: a favourable enabling environment and partnerships with local stakeholders; unique natural resources for ecotourism development; strong social cohesion among villagers; and the competencies of the local people in operating the CFiMP and conducting ecotourism activities.

Kampong Phluk CFi management operates within the legal framework for fisheries management. The community has secured a formal agreement granting management rights to the CFi area. They instated the CFiMP, which guides the members in implementing CFi management activities. Additionally, they receive support from development partners to carry out activities such as fire management and ecotourism.

The community has established and maintained strong relationships with the FiA, enabling the community to obtain support, particularly for administrative and legal matters. Moreover, using the commune development fund, the community constructed a road inside the village as part of the infrastructure to support ecotourism development.

Kampong Phluk is a popular tourism destination for both local and international visitors due to its proximity to Siem Reap provincial town and location along the route to Angkor Wat. The flooded forest, the social and cultural activities of the villagers, and the lake make it a unique and attractive location. Tourism activities have been developed over several years, providing a foundation for further promotion of tourism in the area.

The villagers of Kampong Phluk share a deep connection with and knowledge of flooded forest management, which has been passed down to younger generations. The community engages in collective initiatives such as communal funds, saving groups and restoration activities. Sustainable forest management is integrated into income-generating practices through a strong structure and regulations.

Kampong Phluk has a long history of natural resource management, and the community fully understands the benefits of protecting the flooded forests. The forests safeguard the area from storms, conserve fish spawning grounds and provide the basis for ecotourism and local livelihoods. The community aims to increase the participation of the younger generation in resource management for long-term sustainability.

2.11. Partnerships

Kampong Phluk community has established strong partnerships with local government agencies and private tourism companies through development projects funded by international NGOs and financial institutions. The FAO-funded project Participatory Natural Resource Management in the Tonle Sap Region (1999–2004) laid the foundation for these partnerships by connecting the Kampong Phluk community with local governmental authorities and the FiA. Fisheries officials provided technical support to Kampong Phluk CFi in developing their management plans, combating illegal activities in their CFi area and regenerating flooded forests.

The Tonle Sap Environmental Management project, funded by the Asian Development Bank (2006–2009), continued to formalize the CFiMC and CFiMP in Kampong Phluk. The community is currently part of the Our Tonle Sap project funded by the European Union and led by the Wildlife Conservation Society, RECOFTC and other international and local development agencies. This project aims to restore and protect Tonle Sap ecosystems.

The community-based ecotourism model in Kampong Phluk was strengthened through the bilateral Cambodia–Global Environment Facility Small Grants Programme implemented by the United Nations Development Programme 2006 to 2013 (Equator Initiative, 2020). The project enhanced the ecotourism members' capacity to engage in sustainable tourism activities. Currently, participating villages partner with private tourism companies and tour operators in Siem Reap town to connect tourists to the commune. They also participate in ecotourism networks at provincial and national levels to promote their business further.

Kampong Phluk recognizes the importance of partnerships with neighbouring communes for a collective effort to protect the community's flooded forest.

2.12. Innovation, recognition and outreach

The Kampong Phluk CFi model has inspired other CFis and served as a learning site for several NGOs, students, researchers and conservationists. As members of the Siem Reap provincial ecotourism network, the CFiMC members are often invited to share at regional and national levels their experiences and successes in flooded forest conservation and ecotourism operations.

In 2017, the Kampong Phluk community-based ecotourism (abbreviated as "CBET") won the First Best Tourism Resort award from the Ministry of Tourism. At least three television stations visited Kampong Phluk CBET and broadcasted nationally, resulting in a significant increase in the number of visitors.

3. KEY LESSONS LEARNED

Despite facing challenges, Kampong Phluk CFi is a successful case of sustainable forest management that demonstrates community forestry principles for CFis, as concluded by RECOFTC (2020).

- Development and implementation of community fisheries management plans ensured fish stocks for home use and trade for Kampong Phluk villagers as well as the neighbouring villagers, and long-term fish conservation.
- Clear mandates for members and regular communication with the FiA helped ensure well-informed participatory management and governance of the CFi.
- Securing management rights over the area, supported by governmental policies and enforcement, empowered communities to develop and successfully implement the CFiMP while sustaining management interventions.

- Training and opportunities for livelihood enhancement (through fishing and ecotourism) in the CFi areas addressed community needs and motivated members to take part in sustainable management activities.
- Adaptive management and learning enabled the community to deal with policy and development changes over time, while staying committed to the original management mandates.
- Including junior members in the CFiMC is essential to ensure that the knowledge and philosophy of the CFi are passed down to future generations.

4. FUTURE OUTLOOK

The current objectives of the community's flooded forest management remain relevant for the future, at least for the next ten years. This conclusion is supported by the community's long history of resource management, the strong enabling policy environment and the critical role of the area in providing livelihoods for generations. The mandatory three-year renewal of the CFiMP should be maintained to ensure that the CFi remains adaptive and responsive to any context changes.

To maintain adherence to these objectives, the CFiMC stresses the need for providing training programmes on flooded forest management and income diversification, educating neighbouring villages on conservation and sustainable management, promoting ecotourism, and incorporating technology to improve forest fire management. Youth engagement is considered critical to sustaining the legacy of knowledge, culture and practices of community flooded forest management in Kampong Phluk.

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ASIA-PACIFIC

LAKE TAUPO FOREST: A PARTNERSHIP THAT EVOLVED INTO SUCCESSFUL SELF-MANAGEMENT FOR THE INDIGENOUS OWNERS

Don Hammond, Hammond Resource Management Ltd.

NAME OF FOREST	Lake Taupo Forest, New Zealand
LOCATION	Taupo – Turangi, Central North Island, New Zealand
AREA (ha)	33 733 (24 207 of planted commercial forest and the balance in mostly natural riparian forest)
MANAGING ENTITY	Lake Taupo Forest Trust
MANAGEMENT OBJECTIVES	Sustainable land management through forestry to create economic, social and environmental wealth
FOREST TYPE	Planted forest mostly of *Pinus radiata*

1. INTRODUCTION

Lake Taupo Forest is located in the centre of the North Island of New Zealand. The establishment of the forest commenced in the 1960s on land communally owned by Māori (Indigenous Peoples of New Zealand). Ownership of the forest blocks is established through the distribution of shares in the specific block, which are passed down and split among descendants of previous owners.

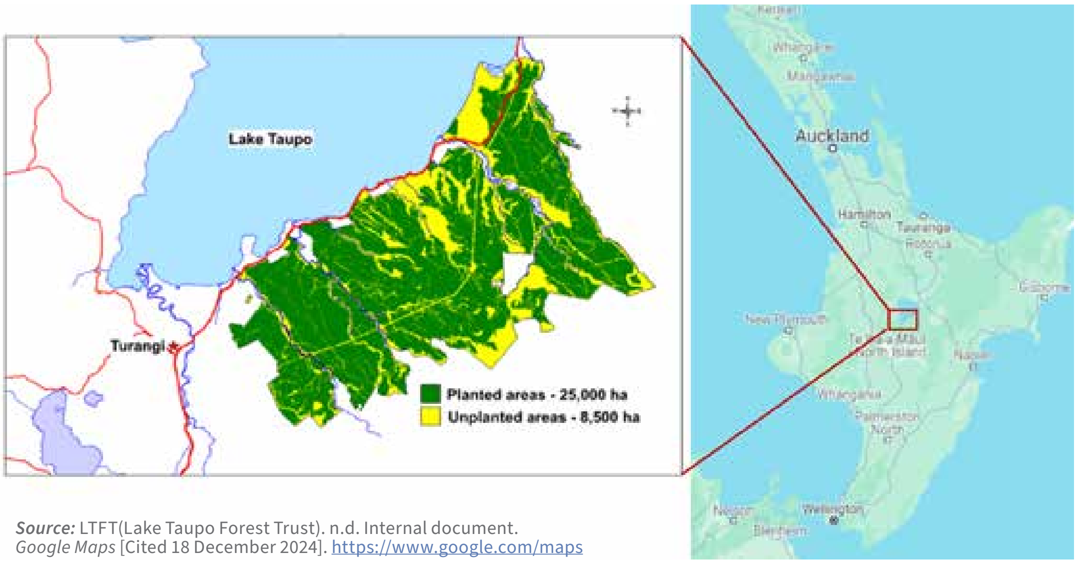
The intricate ownership structure poses significant challenges in achieving economies of scale, particularly for large-scale ventures like forestry, and in securing funding for their development. To address these challenges, the Lake Taupo Forest Trust (LTFT) was established, where owners elected trustees from among themselves to manage the numerous land blocks collectively on their behalf. Currently, the forest encompasses 81 individual land blocks with over 17 000 individual owners.

In the 1950s and 1960s, the Government of New Zealand was active in developing underutilized land into forests and farms. Māori owners were eager to see development and the employment opportunities it would bring, but they did not have the financial resources to achieve it, whereas the government did.

In the 1960s, the government entered a 70-year lease with the owners (through the Trust as the single representative body) to commercially afforest the land with exotic trees. Prior to that, most of the land was not producing any economic returns.

The government achieved a commercial return on its investment in forest plantation development and met its social and economic targets, including protecting the environment, generating employment and creating a long-term sustainable resource for additional downstream processing and export.

Figure 1. *Lake Taupo Forest*



Source: LTFT(Lake Taupo Forest Trust). n.d. Internal document. *Google Maps* [Cited 18 December 2024]. https://www.google.com/maps

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

The Trust has also achieved its goals – landownership has not been compromised, a significant economic asset has been created, many people who are the underlying owners of the individual blocks have businesses and employment on their own land, and the towns they call home continue to thrive. Lake Taupo Forest Trust is now one of the 25 largest commercial forest owners in New Zealand, a remarkable achievement.

Māori have a deep connection to their land, summed up in the *whakataukī* (proverb or saying) *“Whatu ngarongaro te tangata, toitū te whenua”* – people fade away, but the land remains. Therefore, it is vital that the land be nurtured and protected for future generations. For LTFT, it is not the forest that has primacy; it is the land. The land is a *taonga* (treasure).

Geoff Thorp, LTFT’s in-house forest manager explained, “The Trust is not about forestry per se. It is about ensuring the ongoing health and sustainability of the land to support the people. Currently, the best option is forestry. However, many other options are also routinely under consideration.”

The most important statute that impacts the ability of landowners in New Zealand to use their land relates to environmental protection (of soil, air, land and water). The recent Emissions Trading Scheme and the cap on nitrogen leaching, aimed at protecting the adjacent Lake Taupo, will limit the possibility of altering the land use to a non-forest option. Consequently, LTFT will maintain a long-term commitment to forest management on the majority of the land, ensuring the continued stewardship of this environmentally sensitive area.

Research across New Zealand assessing the environmental impacts of various land uses ranks them, in order of increasing impact, as natural forests, forest plantations of exotic species, dry stock pastoral farming, intensive dairy pastoral farming and urban areas. Thus, plantation forestry emerges as a viable option, offering effective protection for Lake Taupo while also generating an economic return.

Lake Taupo Forest Trust is also committed to FSC certification, not only for the price premium it offers but also to ensure adherence to strong environmental and social outcomes.

Lake Taupo Forest landscape comprising the lake, natural riparian vegetation and planted forest rising up to the natural forest

For Māori, the prospect of alienating themselves from their ancestral land is not an option. This prevents them from using the land as collateral to secure funding for development. The initial lease and subsequent return of the land to the owners[1] through the Trust was an exceptionally far-sighted way of overcoming this challenge for the benefit of all parties.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

Since the initial review (Hammond and McKinlay, 2005), the high-level goals of forest management have not changed: protecting the land; generating employment and economic returns; and protecting the environment. There is ongoing refinement in forest operations to achieve these goals as new research results become available and opportunities arise.

Where there has been real change is in the approach of the Trust to its business and investment objectives. The Trust has become considerably more sophisticated in its business analysis and approach to investment. Moving away from a singular focus on the forest assets, there is now a deliberate policy to diversify into other opportunities, with a goal of having 30 percent of assets in non-forestry investments within the next ten years.

This is an ambitious plan. Given the scale of the current forest asset (New Zealand dollar [NZD] 426 million or USD 256 million in 2022), this is an anticipated NZD 150 million (USD 90 million) investment into other sectors. Further, the Trust's core skills to date have been in forestry and related activities, so care needs to be exercised in moving into new areas of investment.

Lake Taupo Forest Trust takes a pragmatic and commercial approach to considering new investment opportunities to ensure the ongoing success of the Trust on behalf of owners. Diversification options considered include energy generation (solar, wind and geothermal), honey from native forests and timber processing (especially sawmilling and downstream value addition from the sawn timber). In addition to financial benefits, the Trust looks for local employment, consistency with *tikanga* (customs and traditional values) and environmental outcomes when considering non-forest investments.

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[1] Progressive handover of the Taupo forest took effect in 2000 after the government accepted an offer by the Trust to shorten the original 70-year lease.

2.2. Type and condition of the forest and scale of operation

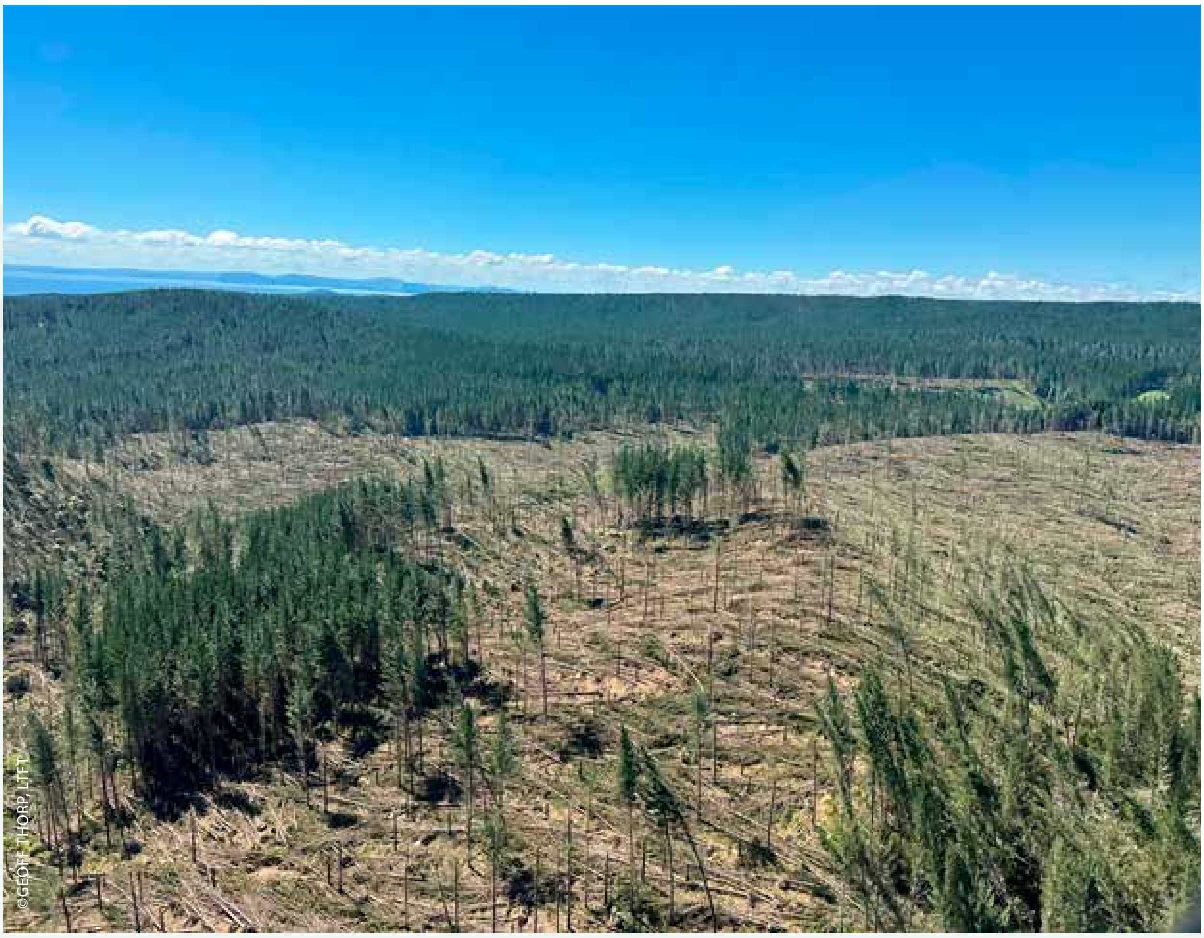
The forest continues to thrive, despite recent climatic setbacks. In early 2023, Cyclone Gabrielle struck the forest, causing considerable damage to older forest stands (15 to 30 years old).

Prior to the cyclone, the planned sustainable harvest was 500 000 tonnes/year for the first rotation crop, increasing to 700 000 tonnes/year for the subsequent rotation. The cyclone has disrupted this plan. The harvest in the current year (2023–2024) is expected to be around 2 million tonnes, with most of this being salvage operations. As this report is being prepared, the number of harvest crews in the forest has risen from the normal five crews to 24 crews. In turn, this will result in a significant reduction in harvest volumes for the following five or more years and will also have significant adverse effects on cash flow due to the higher forest establishment and management costs.

The forest, as a valuable asset, has the potential to overcome challenges and strengthen with strategic planning. Despite an expected reduction in volume over the next decade, ongoing growth and improved genetics will enhance tree development, ensuring the forest remains a substantial asset supporting the local economy.

With the harvesting of the second rotation having commenced three years ago, the third rotation of commercial trees is now beginning to be planted.

Cyclone Gabrielle damage, showing the random nature of the damage



©GEOFF THORP, LTFT

2.3. Legal status and management structure

The planned return of the forest and expiration of the government lease have now occurred, with LTFT being fully responsible for both the land and the tree assets.

Recently, the New Zealand Forest Managers, which had been engaged originally by the government, has been acquired by the Trust, simplifying the management structure. Over time, the acquisition will also create more opportunities for local people to seek managerial and professional roles within their land holdings, as well as facilitate the engagement of landowners in various forest management contractor.

Owning the management company opens up a new business opportunity for LTFT to provide forest management services to other forest owners on a purely commercial basis. This arrangement allows any profits and dividends generated to be channelled back to the Trust for distribution or further investment, a departure from the past where such profits benefited other individuals or entities.

2.4. Regulatory environment and government support

New Zealand has a strong regulatory framework that applies to everyone and covers all activities. This includes the protection of worker safety and prevention of exploitation, the safeguarding of environmental outcomes, the protection of land and asset ownership, and the clear separation of government from the judiciary. New Zealand is also regarded as having one of the lowest levels of corruption in the world, as reflected in the Corruption Perceptions Index.

Alongside this, New Zealand follows a general policy of a free market economy with almost no subsidies for any activity, except when the government intervenes to address events beyond the control of individual landowners or businesses, such as flooding, soil erosion or other climatic events. Consequently, every enterprise is expected to stand or fall on its merits. In addition, most enterprises are treated equally with regard to taxes, royalties, permits and consents.

For all forest growers, including LTFT, this means that their business model needs to be profitable without outside support. To achieve this, the individual business owners determine the level of planning and types of third-party verification that they believe will give them optimal outcomes in terms of meeting customer demands.

Today, many enterprises report on various environmental, social and governance outcomes in addition to traditional financial reporting. Lake Taupo Forest Trust has always addressed some of these non-financial outputs when reporting to the underlying owners of the land, especially in relation to environmental, recreational and cultural outcomes.

2.5. Forest management practices

Commercial forest management in New Zealand continues to evolve. Mechanized harvesting is an example. Previously, all trees were felled and processed into logs by hand using chainsaws; this process is now largely mechanized. While this involves a large capital commitment, it also increases productivity and significantly improves safety for all involved. Lake Taupo Forest is well suited to this change, with most topography suitable for mechanized harvest operations.

The use of chemicals remains standard practice during pre-planting land preparation and for weed control after planting. If fungal pathogen levels become too high, copper fungicide may be applied. The types and amounts of chemicals used have continued to change based on new research findings, with considerably lower amounts now being required to achieve the same or better outcomes.

The Trust has also invested heavily in genetic improvement of the tree stocks used in replanting and continually strives to improve all forest management practices.

A standard silvicultural regime includes pre-planting land preparation (both mechanical and chemical), followed by hand planting of 833 trees/ha for stands to be pruned and 1 000 stems for stands that will be left unpruned. About 70 percent of the forest is pruned (branches on the lower 5.5 m of the trunk are removed). The pruned stands are thinned to a final stocking of 300–320 trees/ha. Unpruned stands planted at higher densities are thinned to a higher stocking to maximize production volume. Harvest by clearfelling is usually done at around 28 years of age.

In addition, test planting at lower stockings (around 750 stems/ha) has been carried out using clonal tree stocks selected for optimal growth and form.

Forest Stewardship Council certification requires adherence to various rules relating to chemical use, engagement with communities, and social, legal and environmental practices, which are all factored into the way Lake Taupo Forest is managed.

The forest operates on a "sustained yield" model. As the forest (prior to the cyclone) was largely in a steady state, a sustainable annual harvest of around 850 ha is planned; therefore, only a small part of the forest is subject to clearfelling each year and is replanted the following winter. The disruption caused by the cyclone will require this practice to be altered in the short term, but the plan remains to have a constant flow of wood, employment and revenue.

As the forest is now well into its second rotation, most of the required harvesting infrastructure (i.e. roads and landings) is in place. The harvested trees are moved to the landings while most of the slash remains on the cutover land and provides nutrients back to the new crop. As the soils on which the forest is growing are young and poorly developed (due to recent volcanic eruptions), minimizing the loss of organic matter and nutrients is an important consideration for forest management.

2.6. Production and business aspects

Due to the investment in genetics and improvements in other forest management processes, an estimated 40-percent increase in productivity is possible in the second rotation. Deployment of clonal tree stock is a major contributor to this increase, giving higher growth rates, increased wood density, improved disease resistance and a range of other traits sought after by both forest managers and customers.

Given LTFT's location, supplying domestic markets with logs is important for maximizing returns by reducing transport costs. Lake Taupo Forest is a major supplier in the Central North Island of high-quality pruned logs along with structural logs and arisings (lower-grade wood suitable for fuel or pulp) for domestic sawmills and pulp mills. There is also increasing interest in and demand for biomass for energy, which is likely to be another option for forest arisings and residues going forward.

End products generated include structural lumber, pulp and paper, and appearance-grade clear timber for domestic and export. Having FSC certification allows sales to companies that require certification.

2.7. Social aspects and impacts

John Bishara, the CEO of LTFT, highlighted a key message: "Sustainable land management across our own *whenua* [land] according to our own *tikanga* is central to us as people of *Tuwharetoa* [the Tribe]. The forest allows us to do that through its multiple outcomes – financial, environmental, cultural and social."

Since harvesting commenced in the 1990s, LTFT has distributed NZD 100 million (USD 60 million) in dividends and grants from income received from its forest activity. Each year, the Trust carefully determines the appropriate distribution amount, ensuring that sufficient funds are allocated for reinvestment in the forest and non-forestry investments. All landowners receive an annual dividend based on their specific shareholding in the

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Trustees of the Lake Taupo Forest Trust

overall land. Additionally, the Trust dedicates grants for tertiary education and support of *kaumatua* (elders), as well as for a range of other social and cultural initiatives.

Approximately 50 percent of the total harvest revenue returns to the Trust as net revenue. Approximately one-third of this is used for replanting and forest management, one-third is used for distributions and grants, and the balance is for other investments and running costs for the Trust.

The forest also provides employment opportunities for local people, many of whom now have their own businesses as forestry contractors (e.g. as harvesting and transport crews). Approximately 50 percent of the people working in the forest are local landowners, according to annual workforce surveys.

Hunting has an important cultural value and is allowed only for landowners in the planted and reserve forest area. Prior to European settlement, hunting of native birds was traditionally practised for food. Today, hunting of introduced species of deer, pigs and freshwater fish is carried out by many who seek to provide food this way instead of shopping at the supermarket. Hunting is permitted year-round, outside certain restrictions to protect worker safety during working hours or to protect the forest during periods of extreme fire risk.

Collection of medicinal plants (found in natural areas and planted forests) and firewood is also practised, as is visiting *wahi tapu* (sacred areas). Access is managed under a permit system, and each year around 1 000 landowners access the lands – some doing so multiple times each week.

2.8. Environmental values and impacts

Lake Taupo Forest sits adjacent to Lake Taupo, the largest freshwater lake in the southern hemisphere and roughly the size of Singapore. Research shows that land use around the lake has the potential to degrade water quality, especially because of nutrient and sediment runoff (Larned *et al.*, 2016). Natural forest is the original land cover, and this remains the best land use for protecting the lake. Commercial planted forest is the next best option.

Lake Taupo Forest consists of approximately 25 000 ha of commercial plantation forest and an additional 8 000 ha of native riparian vegetation. These land uses were deliberately selected to reduce nutrient and sediment runoff into the lake and to provide habitat for native species.

As mentioned previously, regulatory requirements for environmental protection limit the ability of LTFT to change land use in a major way.

2.9. Challenges and threats

Threats to the Lake Taupo Forest include cyclones, landslides, fire and periodic volcanism. The forest is located in a volcanically active region; in 1995, the nearby Mount Ruapehu erupted, sending large volumes of ash over the forest. The Trust is also aware of the changing climate patterns and is investigating ways to mitigate the potential climate change impacts.

Market risks are ever present, and there are challenges related to the long distance from processing facilities and export ports. However, market risks for forestry are declining as the world seeks to decarbonize, and particularly so in New Zealand, where there are few other options to decarbonize at scale other than using forest products.

While some forest owners are able to capture benefits from carbon credits, Lake Taupo is unable to do so because of the rules that govern this market. Simply put, land that had a forest on it in 1990 cannot claim carbon.

Biological risks, especially from new invasive species or from existing species that are given a boost through changing climate, are present. However, New Zealand has a robust biosecurity system in place because of its heavy reliance on exports of biological crops such as timber. Additionally, Lake Taupo Forest is part of an annual national surveillance programme coordinated by the New Zealand Forest Owners Association to assist in the early detection of new biological threats.

Transitioning to the use of clonal tree stocks raises concerns about genetic risks. Measures to mitigate this risk include not planting all areas with clonal material and deploying a range of clones. While the potential genetic risks must be carefully considered, they need to be balanced against the substantial growth and form improvements that clonal trees can provide.

Demands for greater involvement of landowners in the activities of the Trust is a less obvious but nonetheless critical issue. As Bishara says,

> *Traditional leadership, which provided the successes we have achieved in our beginnings, will require a change in our approach to gain greater trust and confidence as opposed to just elected Trustees. Our families and hapu [subtribes within a clan] are demanding greater participation and involvement in the Trust's activities conducted on their lands. This is a modern and global phenomenon. Like other parts of our society, alternative narratives and loss of trust in governments and similar entities are very pervasive today, but we must act now.*

2.10. Opportunities

Lake Taupo Forest Trust has the capacity to investigate and determine the merits of emerging opportunities (e.g. solar, wind and geothermal energy generation) and to allocate the required resources should an opportunity pass the various tests established by the Trust.

For opportunities related to the forest, such as improved genetics and mechanization, the decision can be straightforward. However, for opportunities outside forestry, a range of other factors need to be considered. Business management frameworks can be developed to support decision-making, and the Trust has created a subsidiary with these specific skills to investigate and pursue such opportunities.

Beneath these considerations, though, is the underlying principle that the land remains, the environment must be protected and, where possible, enhanced, and the owners need to be brought along on the journey.

2.11. Partnerships

Lake Taupo Forest makes an interesting case study, as it commenced life as a "partnership" with the government through the original lease. In part, the intention of that agreement was to build capacity so that the Trust could take over the forest and become a standalone owner without the need for a partner. This has been achieved, with the Trust having the ability to operate completely independently.

While it is unlikely that the Trust would seek a forest partner in the near term, there is potential for a partner in other activities such as timber processing and alternative land uses such as energy generation, honey production and tourism. Any such engagement would be contingent on ensuring the land remains protected and provides a suitable return to the landowners.

In a wider sense, the Trust engages in extensive collaboration within New Zealand's commercial forestry sector. This includes participation in various committees as well as involvement in research, science and innovation projects in the forestry sector.

As with all forest owners in New Zealand, the Trust pays a levy on all logs produced (currently NZD 0.33/tonne, or USD 0.20/tonne), which is used for research, training and education, fire management, market development and biosecurity for commercial forest estate. This is in addition to the direct investments it regularly makes in research and development within the forest itself.

2.12. Innovation, recognition and outreach

Lake Taupo Forest Trust places much emphasis on deploying genetically improved tree stocks. This produces a forest that grows more uniformly and quickly, making the scheduling of tending operations easier and dramatically increasing yields.

Mechanization of harvest is another area of innovation resulting in improved safety, productivity and accuracy of outputs.

Adoption of digital technology is now widespread throughout forest management, such as the use of lidar for mapping and planning, remotely sensed data for growth modelling, the use of drones, and data capture and storage. Even predator and pest control has been strengthened with self-resetting traps that use telemetry to notify managers of trap outcomes and any need for servicing – a massive cost reduction and efficiency improvement.

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Pruning operation in the forest

3. KEY LESSONS LEARNED

The particular situation facing the landowners in the 1950s and early 1960s was that they lacked scale, governance and financial resources to develop their land, and the land could not be used as collateral to secure funding from mainstream funders (e.g. banks). The government, on the other hand, was seeking land of adequate scale to generate employment, create a natural resource base, and make returns on investment. Both the Trust and the government were able to achieve their desired outcomes through this partnership, a key aspect of which was that the replanted forest would be returned to the Trust upon expiration of the lease. This has taken place with the Trust now having full control of forest management and a major economic asset providing them with the autonomy to chart their own course into the future.

The key learnings include the importance of having clearly defined goals, effective dispute resolution strategies and, most critically, a high level of trust on both sides. These arrangements must always be win–win, as any other outcome ultimately results in both parties losing.

4. FUTURE OUTLOOK

The future for LTFT is bright, despite the setbacks caused by the recent cyclone. The Trust has the capacity and financial means to pursue other goals (e.g. health, education and other benefits for landowners). It has retained full control of the land and has created substantial employment and training opportunities. In short, the Trust has the ability to control the environmental, social and governance outcomes from its investments.

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ASIA-PACIFIC

NAKAVU FOREST AFTER 20 YEARS: LOOKING BEYOND TIMBER

Don Hammond, Hammond Resource Management Ltd.

NAME OF FOREST	Nakavu Forest
LOCATION	Namosi Province, Viti Levu Island, Fiji
AREA (ha)	315
MANAGING ENTITY	Forest Research Division, Ministry of Fisheries and Forests, under the Conservator of Forests
MANAGEMENT OBJECTIVES	Demonstration of sustainable timber production model; collaborative research
FOREST TYPE	Natural mixed evergreen tropical rainforest

1. INTRODUCTION

Fiji is an island nation in the South Pacific, supporting a population of just under one million people as of 2023, and is considered one of the most developed island economies in the Pacific. As in many Pacific Islands, there has been a history of heavy forest exploitation for commercial timber in Fiji over the past 250 years, especially following the arrival of Europeans. This has left many landowners with heavily degraded forests that have limited potential for future timber production.

In the past few decades, there has been increased support for sustainable management of the remaining native forests, which require detailed management planning based on sound science and research.

Nearly 50 percent of land in Fiji remains under indigenous ownership. In 1940, the Fiji Native Land Trust Act established the Native Land Trust Board, a statutory authority that controls all native land to be managed for the benefit of indigenous landowners.

The Board has undergone major changes since its establishment to make it more commercial and customer-oriented in its focus. The Board's revised policy now focuses on maximizing revenue to indigenous landowners, securing benefits for the national economy and prompting sound relationships between stakeholders.

Fiji has the longest experience in sustainable forest management (SFM) in the South Pacific, exemplified by the Nakavu Forest, which was established through the country's long-term cooperation with GIZ in the forest sector (Mussong, 2011). In addition, Fiji has the only existing and well-documented demonstration area for natural forest management. The demonstration area is identical to the former Natural Forest Management Pilot Project area where, in the early 1990s, an SFM concept for communally owned native rainforests was developed by the Fiji Forestry Department and GIZ.

In 1991, the village owners of the land on which the forest is established signed a 50-year lease with the Forestry Department, allowing the forest to be used for research associated with the sustainable harvesting of timber. The forest was initially classified as mostly undisturbed, native dense mixed evergreen rainforest with an upper canopy at around 25 metres.

This review builds on the previous *In Search of Excellence* case study “Nakavu Forest: research makes the difference” (Lenoa, 2005) and captures key changes and developments over the past two decades.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The original management objectives were to promote SFM and build capacity in local communities, and to understand the impact that various intensities of harvesting had on the residual forest and its subsequent growth and development. Harvesting intensity refers to the percentage of merchantable timber removed from each compartment or trial block. This objective remains but has now been complemented by further opportunities in the form of payments for carbon sequestration, thus contributing to climate change mitigation.

The main bridge into Nakavu Forest was washed away by storms in 2015, after sustaining gradual damage over its 30-year lifespan. Its final destruction occurred during the second harvest, leading to a halt in harvesting and limited activity in the forest for the next eight years. The planned work programme is expected to resume once the bridge is rebuilt, which is forecast for 2024.

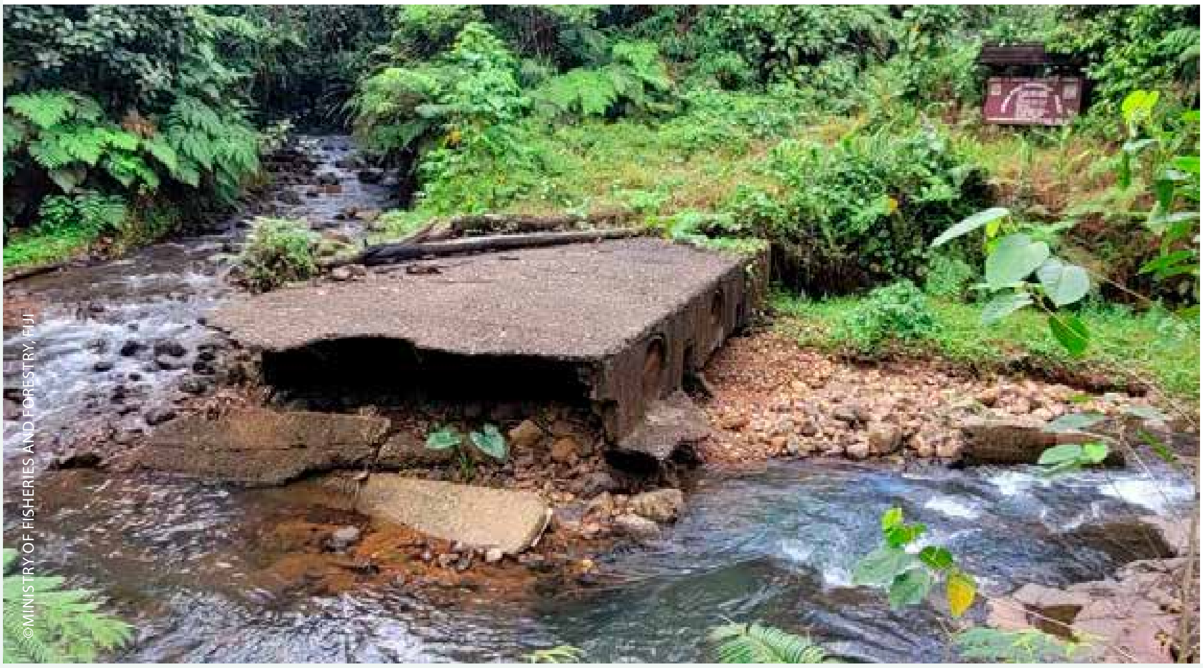
The loss of the access bridge and curtailment of operations highlights the potential vulnerability of many small-scale projects and communities to events external to the forest, particularly in countries with relatively small economies. Securing the necessary resources to rebuild infrastructure can be a challenge and can take considerable time. The photo below shows the damage, which will require the crossing to be completely rebuilt so heavy trucks can remove logs from the forest.

2.2. Type and condition of the forest and scale of operation

Nakavu is an indigenous lowland rainforest in a modified state due to logging. The forest contains a combination of slope, ridge and river-flat forest types.

Recent assessments (Mussong and Setareki, 2014) have confirmed the ongoing growth of residual trees following lower levels of harvesting than previously practised. The lower-intensity harvesting has resulted in the faster recruitment of smaller trees into merchantable diameter classes, while at the same time providing additional benefits such as

Destroyed bridge to access Nakavu Forest at the confluence of two major creeks



©MINISTRY OF FISHERIES AND FORESTRY, FIJI carbon sequestration, enhanced forest biodiversity and a range of non-timber benefits.

As noted elsewhere, different harvesting intensities are applied to various compartments. Higher harvesting intensities in certain compartments entail the removal of more trees, including those with smaller diameters, thereby increasing the total removal of merchantable volume.

2.3. Legal status and management structure

The forest and underlying land continue to be owned by the local people, with the lease still in place since 1991 and the research allowed to continue. The Native Land Trust Board helps to ensure that landownership is protected. No changes to the land tenure have occurred.

In the agreement to lease the land, the government agreed to pay timber royalties to the landowners. The management plan developed for each harvest also incorporates checks to ensure that the correct royalties are paid to the landowner.

This is an important protection: without such a requirement, there would be a much greater incentive for the landowners to simply harvest their forest, leaving no merchantable timber, and sell the logs to the highest bidder. This is always a challenge when considering SFM, as it requires the landowner to forego immediate income from the forest with the expectation that future benefit streams (both financial and non-timber benefits) will accrue and exceed the short-term gain.

Responsibility for actual operations lies with the Ministry of Fisheries and Forests through their Research Division.

2.4. Regulatory environment and government support

As with most countries around the world, the regulatory environment in Fiji continues to change, generally aiming for higher environmental outcomes. In this case, however, there has been limited change affecting the forest or its management.

The government, through the Ministry of Fisheries and Forests, continues to lease the land and carry out the operational management associated with the research work. They also have oversight of the contractors employed to harvest the trees and transport them to the mill.

The replacement of the bridge has also been awaiting government resources.

2.5. Forest management practices

Nakavu is a natural forest managed under a harvesting scheme designed to assess how the forest responds to harvest interventions. Detailed research plans were developed to cover a range of activities, resulting in varying levels of harvest. The forest was divided into 12 compartments averaging 26 ha each (with a range from 13 to 38 ha). Compartment boundaries were defined by natural features and cleared straight lines, all of which were accurately recorded on maps (**Figure 1**).

A 25-metre-wide strip sampling system was then used to provide an inventory of the forest, including numbers of trees, basal area and standing volumes for various diameter classes. From this, diameter limit tables were developed for each species and trees to be harvested were identified.

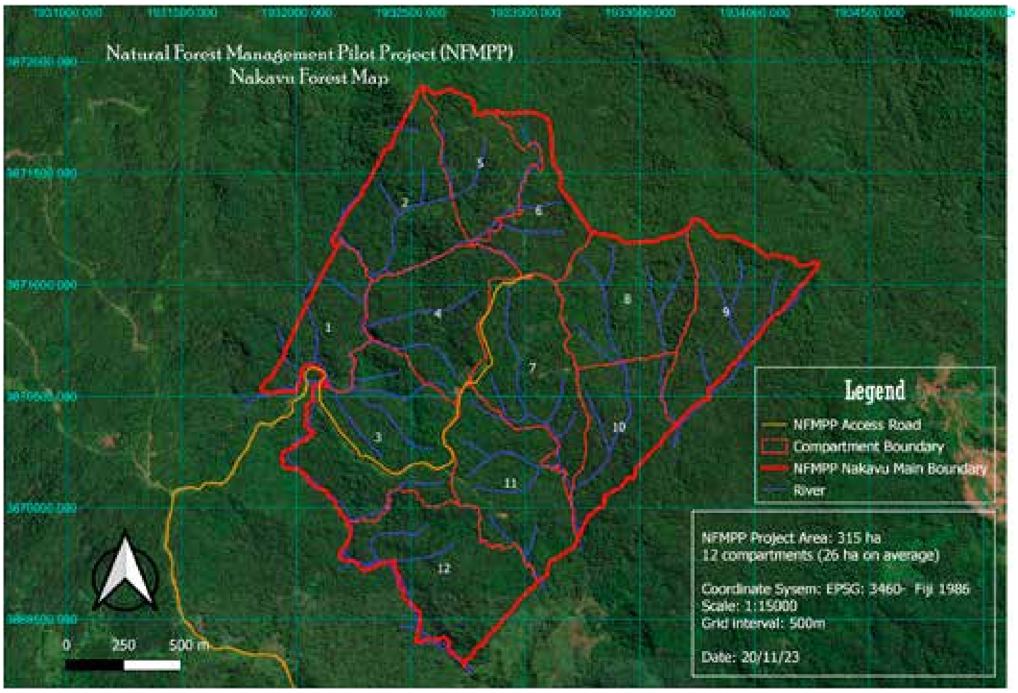
Finally, three levels of harvest were determined as follows:

- light logging (removal of 15 percent of the standing volume of trees greater than 35 cm in diameter at breast height [dbh]);
- medium logging (removal of 33 percent of the standing volume of trees greater than 35 cm in dbh); and
- heavy logging (removal of 60 percent of the total standing volume).

A fourth treatment called “conventional logging” was included, in which all commercial trees (i.e. greater than 35 cm in dbh) were removed, allowing comparisons to be made between the conventional logging practice and the “new” ideas on sustainable harvest. An untreated control was also included (**Figure 2**).

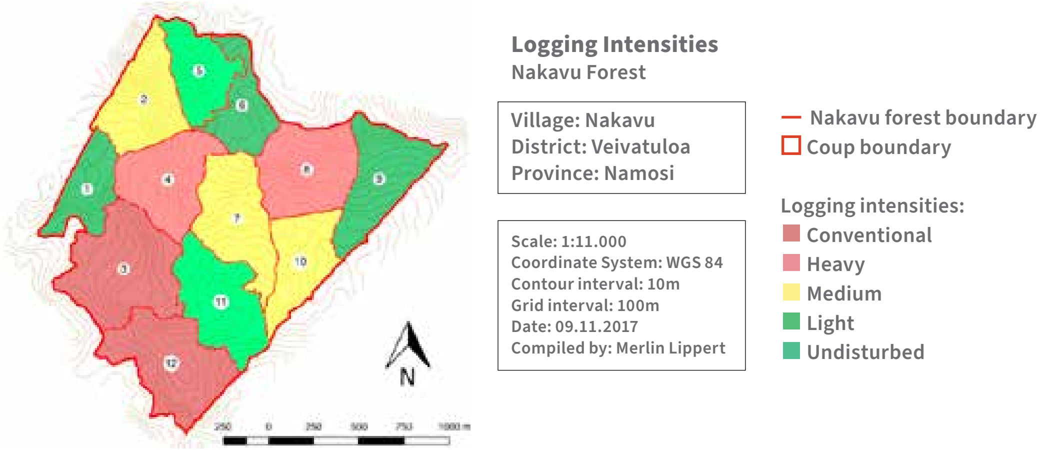
Conventional harvesting practice at the time focused on planning road and infrastructure layout to facilitate harvest at lowest cost. The new approach required more detailed planning for infrastructure, establishment of permanent sample plots[1] remeasured biannually to monitor changes and forest growth, marking of selected trees prior to harvest, careful felling and extraction of felled trees to minimize impact on the residual forest, and post-felling damage assessment.

Figure 1. *Nakavu Forest compartments*


Natural Forest Management Pilot Project (NFMPP)
Nakavu Forest Map
1
2
3
4
5
6
7
8
9
10
11
12
Legend
NFMPP Access Road
Compartment Boundary
NFMPP Nakavu Main Boundary
River
NFMPP Project Area: 315 ha
12 compartments (26 ha on average)
Coordinate Sysem: EPSG: 3460- Fiji 1986
Scale: 1:15000
Grid interval: 500m
Date: 20/11/23
0
250
500 m

Source: Ministry of Fisheries and Forests, Fiji. n.d. Internal document.
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

Figure 2. *Nakavu Forest harvesting pattern*


Logging Intensities
Nakavu Forest
Village: Nakavu
District: Veivatuloa
Province: Namosi
Scale: 1:11.000
Coordinate System: WGS 84
Contour interval: 10m
Grid interval: 100m
Date: 09.11.2017
Compiled by: Merlin Lippert
Nakavu forest boundary
Coup boundary
Logging intensities:
Conventional
Heavy
Medium
Light
Undisturbed
N
1
2
3
4
5
6
7
8
9
10
11
12
250
0
250
500
750
1000 m

Source: Ministry of Fisheries and Forests, Fiji. n.d. Internal document.
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

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[1] Permanent sample plots are established to ensure that the same trees are measured each time over a period of years or decades. The plot is permanently marked in the forest and trees are individually identified so they can be relocated and remeasured.

For many participants, the new approach seemed radical – Why leave harvestable trees behind? Why worry about the state of the residual forest? The advocates for SFM needed to challenge and change the conventional wisdom of that time.

Detailed planning is carried out by the Ministry of Fisheries and Forests Research Department staff to identify the trees to be removed. These are then physically marked in the forest so the contractors will harvest the correct trees.

As the map below (**Figure 3**) shows, each tree to be removed has been enumerated and marked. Volumes to be extracted are known, previously formed extraction routes are used, and harvest crews are trained to minimize damage or impact on the residual forest. The focus is less on the amount of wood removed and more on retaining a functioning ecosystem.

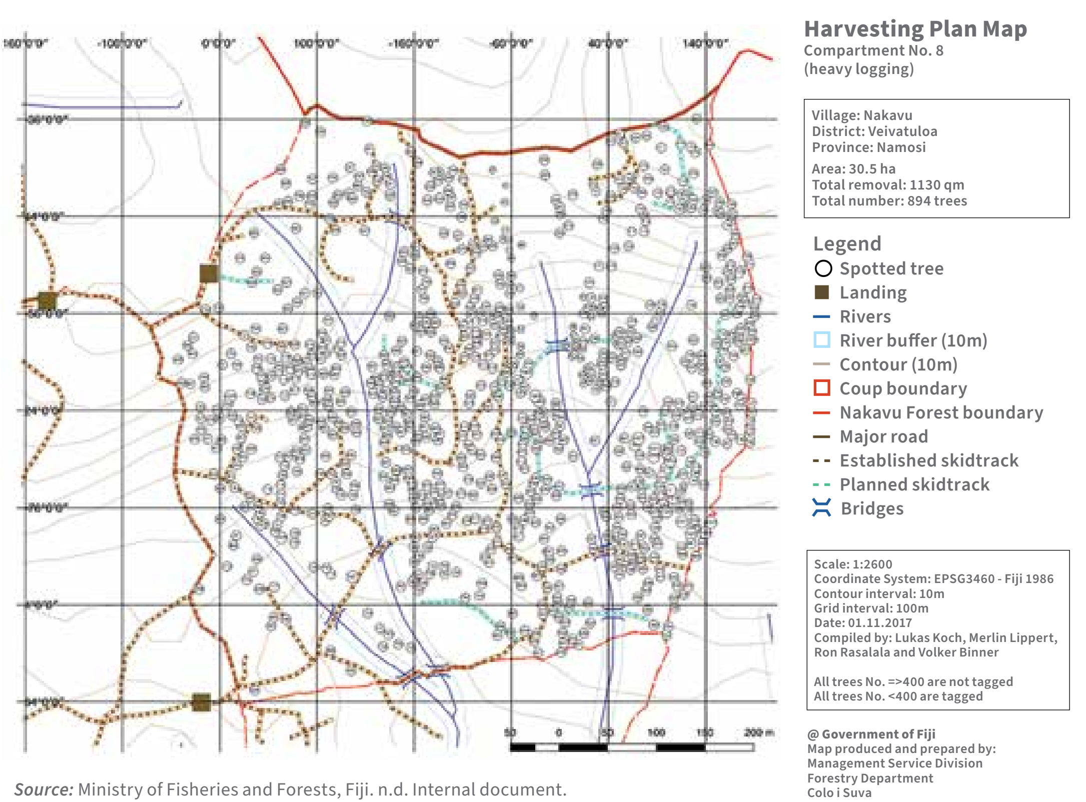
Following harvest, the logged compartments are left to regenerate naturally, without further input such as planting, releasing or thinning until the next harvest.

This introduces an opportunity for further inventory and data collection to understand the recruitment dynamics, including whether the harvested tree species are regenerating or the forest composition is shifting. It also provides a chance to explore low-level interventions that could enhance harvestable volumes during future harvests, among other considerations.

Such considerations extend beyond the original intention of the management plan, which focused on “replicating” the original indigenous forest. Addressing these new opportunities may require both financial and professional support. However, nothing is ever static, and a long-term research project such as this may also need to adapt.

The original harvest of each plot was completed

Figure 3. *Detailed harvest map prepared prior to harvest, with every tree identified and marked*


Harvesting Plan Map
Compartment No. 8
(heavy logging)
Village: Nakavu
District: Veivatuloa
Province: Namosi
Area: 30.5 ha
Total removal: 1130 qm
Total number: 894 trees
Legend
○ Spotted tree
■ Landing
— Rivers
☐ River buffer (10m)
— Contour (10m)
☐ Coup boundary
— Nakavu Forest boundary
— Major road
- - Established skidtrack
- - Planned skidtrack
Bridges
Scale: 1:2600
Coordinate System: EPSG3460 - Fiji 1986
Contour interval: 10m
Grid interval: 100m
Date: 01.11.2017
Compiled by: Lukas Koch, Merlin Lippert, Ron Rasalala and Volker Binner
All trees No. =>400 are not tagged
All trees No. <400 are tagged
@ Government of Fiji
Map produced and prepared by:
Management Service Division
Forestry Department
Colo i Suva
Ph: 3320667
50
0
50
100
150
200 m

Source: Ministry of Fisheries and Forests, Fiji. n.d. Internal document.
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

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Logs extracted from the forest, ready for transport to a processing site

by 1994, with a second harvest commencing in 2014. A contractor was engaged to log only the trees that had been specifically selected and marked. Put another way, it was the forest management considerations, not the contractor, that determined which trees were to be removed.

After the second harvest began, the contract with the initial contractor ended and another contractor had to be sourced. This event was followed in early 2015 by a major storm that destroyed the road bridge providing access to the forest, forcing a halt to harvesting operations.

In 2023, the government announced funding for a new bridge and has called for tenders. This will enable the second harvest to be completed.

Throughout the last 20 years, management has been focused mainly on harvest volumes, harvesting impacts and costs. Only more recently has there been interest in other features, such as biodiversity, water quality, off-site impacts and carbon.

2.6. Production and business aspects

Production from the forest is planned to be intermittent, as prescribed in the SFM plan. The initial harvest, carried out at a reduced intensity, will be followed by subsequent harvests after a period of several decades.

With approval to build a new bridge in the coming year, it is anticipated that the second harvest will be completed shortly after.

A question that then arises is when to schedule a subsequent harvest – 20 years after the second harvest (some of which occurred in 2014/15, with the remainder expected in 2024) or in line with the original planned timeline, aiming for the next (third) harvest around 2035. This is where detailed inventory and forest monitoring should assist in decision-making. Can the forest sustain another harvest sooner, or should it be delayed? Are there management and silvicultural interventions (such as the application of fertilizer) that could accelerate growth, and at what point should the optimal harvest intensity be determined? Overarching these considerations is an economic question: Will the additional cost of interventions like fertilizer application be justified by a corresponding increase in growth and harvestable volume?

Four different harvest intensities were originally included in the management plan. While it is reasonable to exclude the conventional harvest intensity (i.e. the removal of all merchantable wood), the question remains: Which of the other three intensities is optimal from both a forest growth and economic perspective and an environmental and other forest services perspective?

Early indications from the first harvest suggest that lower harvest intensities lead to faster forest recovery and enhanced carbon sequestration. Merchantable stems also appear to recover more quickly under lower harvest intensities. However, enthusiasm over this early data needs to be tempered by the knowledge that a single data set is not sufficiently robust. Further harvests and measurements are required.

The SFM model, as it was set up, primarily focused on timber production. However, today, other criteria (such as carbon sequestration) have grown in significance. Even less is known about other non-timber aspects, such as amenity value for landowners, the transition of understorey species and the invasion of weeds, among others.

2.7. Social aspects and impacts

Lease payments are made to the land-owning community every six months, in addition to any royalty payments due when trees are harvested. This means that the community earns a small annual income from the forest for its retention and periodically receives royalties when logs are sold. Lease contributions are distributed to members of the Matagali (clans), but the total value of that lease is confidential.

In practice, this means that there needs to be an external source of revenue, whether from the government (in this case) or from outside investors seeking to make philanthropic investments.

The very intermittent harvest activity highlights another issue for these communities: how to smooth

Drone image of Compartments 6, 7 and 8 after logging, with access roads separating each compartment

©MINISTRY OF FISHERIES AND FORESTRY, FIJI income streams. Ultimately, this is only likely to be achieved at scale when the non-timber benefits of retaining forests are recognized and monetized. These non-timber benefits include the traditional use of the forest for firewood, fishing, pig hunting and traditional medicines. Placing a value on those benefits remains difficult, while the value of logs is easily determined.

2.8. Environmental values and impacts

Often, the non-wood attributes and benefits of forests are overlooked, and it is often difficult to quantify the value of these benefits in economic terms. However, Fiji does have one excellent example of one of these benefits.

Export of Fiji Water to over 60 countries around the world is the largest export earner for the country and has five times the value of more well-known exports such as sugar. The water is sourced from the Sovi Basin, in dense rainforest less than 50 km from Nakavu. The forest's role in protecting water quality is an important factor in the success of Fiji Water. This is a tangible non-wood benefit that the forest provides.

A recent study (Mussong and Setareki, 2014) of the forest to assess carbon stocks (which were not part of the original plan) has demonstrated further benefits from SFM where lower intensity of initial harvest is carried out. By reducing the volume of wood harvested, more carbon is retained on the site and is replaced more quickly following a harvest of reduced amounts of timber.

Carbon trials have been carried out in Nakavu, although no details are yet available.

This non-timber product (i.e. carbon) is an example of the growing recognition of previously unconsidered or unknown benefits of SFM. If opportunities arise to monetize these benefits, forest owners could realize substantial additional value.

2.9. Challenges and threats

The project is being managed under a 50-year lease, which at the project's start was seen as a very long time. Today the lease is over two-thirds complete, and consideration needs to be given to what happens next. Planning for next steps (and potential funding) should be established before the existing lease term expires.

The upcoming renewal of the lease creates both a threat and an opportunity. If the landowners can see that benefits have accrued, they may be supportive of a new lease to continue the research and to refine how the forest can be managed. If, on the contrary, the landowners feel they have been left out and have not received benefit, they may be unwilling to renew any arrangement, resulting in the loss of significant institutional knowledge and opportunity.

A wide range of other threats also exist that are not unique to Nakavu Forest, including climate change impacts, pest incursions and fire, as well as their interconnections. Hotter, drier conditions can lead to increased fire risk and can also make conditions more suitable for certain pests that may not have otherwise survived.

2.10. Opportunities

As previously mentioned, one of the more recently recognized benefits from SFM has been the higher level of carbon stored in the forest with reduced harvest intensity – primarily due to the greater number of remaining large trees where the majority of the carbon is stored. In a world where the costs of carbon emissions are increasing, this is potentially a significant benefit if it can be satisfactorily quantified. This benefit is further enhanced if the harvested logs are used for long-lived products, such as houses, as the embedded carbon is not released into the atmosphere for many decades. During that time, the forest will regrow to replace the harvested trees.

The Nakavu SFM model has been expanded to other forests such as Drava, demonstrating the success of the model that has taken several decades to refine. Demonstrating these benefits to other

MINISTRY OF AGRICULTURE FISHER AND FORESTS
NATURAL FOREST MANAGEMENT PROJECT
DO NOT DAMAGE THE VEGETATION BUT DO ENJOY YOUR VI

Nakavu Forest, Fiji

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forest-owning communities is a real opportunity to promote SFM as a solid and beneficial model for other landowners.

A further opportunity exists in recent advances in remote sensing, data capture and analysis, and lower-impact harvest activity. These advances could enhance the outcomes from the forest for both owners and the environment.

2.11. Partnerships

The entire project is built on a partnership between the Forestry Research Division of the now Ministry of Fisheries and Forests and the landowners. The initial collaboration with the German agency GIZ has continued, but more recently it has focused on Reducing Emissions from Deforestation and Forest Degradation (REDD+),[2] a climate change mitigation approach. The key mechanism of REDD+ is to compensate forest owners for choosing not to log their forest or, in the case of Nakavu, for pursuing SFM, which involves a reduction in harvest output in the short term.

Funding for these types of projects has always been a challenge, even in developed economies, and it is unlikely that the situation will change in the near term. It is therefore important to build relationships and partnerships with key parties that will endure in an ever-changing world.

2.12. Innovation, recognition and outreach

Longitudinal studies such as at Nakavu have a key advantage in that they compile long-term data and information on the structure and composition of the forest and the impact of harvesting. Longitudinal studies in forestry are not common and even less so in tropical forests such as in Fiji. This reality is in large part due the exploitive nature of traditional forest harvesting, where valuable timber species are removed, and operations then shift to the next forest with little regard for the condition or future of the residual forest.

With rising interest in a more holistic approach to forests and the incorporation of non-timber attributes, longitudinal studies become increasingly necessary. Added to this is the global recognition of certain externalities of human activities, such as deforestation and the use of fossil fuels, on climate change.

Forests such as Nakavu then become even more valuable as a source of rare information on what is happening through time and as a result of various management interventions.

Globally, initiatives such as REDD+ are working to reduce, measure and report greenhouse gas emissions in forests. The Pacific Community, in cooperation with GIZ, has been supporting the national governments of Fiji, Papua New Guinea, Solomon Islands and Vanuatu to fulfil REDD+ requirements.

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[2] The "+" stands for additional forest-related activities that protect the climate, namely sustainable management of forests and the conservation and enhancement of forest carbon stocks.

When established, the focus of research at Nakavu was to understand the impact of harvesting at various intensities on the long-term outcomes for the forest. Now, there is also considerable added value in being able to understand the carbon and hence climate impacts of that management.

In turn, there is a need for careful planning and implementation of a research programme to optimize data collection without undue increase in cost or complexity. Careful planning and execution are particularly important where results are measured in decades and cannot be quickly replicated. These factors also reinforce the need for continuous adaptations and adjustments in planning.

3. KEY LESSONS LEARNED

Two key learnings from this case are the importance of keeping an open mind about potential future applications of a project like this, and the ability to monetarize some non-timber opportunities. When the project was first established, consideration of carbon and emissions tracking was in its infancy. Today, it is a key focus of many businesses in the land-use sector. This shift necessitates a change in mindset to a long-term view in order to understand the implications that arise over longer time periods.

4. FUTURE OUTLOOK

The Nakavu model is often regarded as the best way for managing these types of forests to ensure their sustainability. Demonstrating its benefits to other forest-owning communities presents an opportunity to promote SFM as a solid and advantageous model for other landowners.

Although Nakavu is an experimental forest, it still produces merchantable logs that benefit the local community. It also provides valuable insights into the impacts of high- versus low-intensity harvesting, which can then be adapted and applied in other forests.

One of the challenges in further promoting the uptake of this approach is the intermittent nature of the income that this approach provides to landowners. If the time between harvests could be reduced through increased growth rates and revenues increased through improved log value, there would likely be wider acceptance of the principles of SFM.

Potential strategies to achieve more frequent or higher royalty payments include conducting commercial thinning, implementing tree breeding programmes, and replanting with improved trees stocks instead of relying on natural regeneration. The use of fertilizer to enhance growth is another option. Faster growth could result in smaller compartments being harvested for the same volume of production, generating a reduction in time between harvests.

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ASIA-PACIFIC

PERIYAR TIGER RESERVE: A SUCCESSFUL 50-YEAR CONSERVATION JOURNEY

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NAME OF FOREST	**Periyar Tiger Reserve**
LOCATION	**Idukki and Pathanamthitta districts of Kerala, Southern India**
AREA (ha)	**92 500**
MANAGING ENTITY	**Kerala Forest and Wildlife Department**
MANAGEMENT OBJECTIVES	**Biodiversity conservation with a focus on tigers; strengthening ecodevelopment; enhancing protection through community-based ecotourism**
FOREST TYPE	**Tropical moist forest**

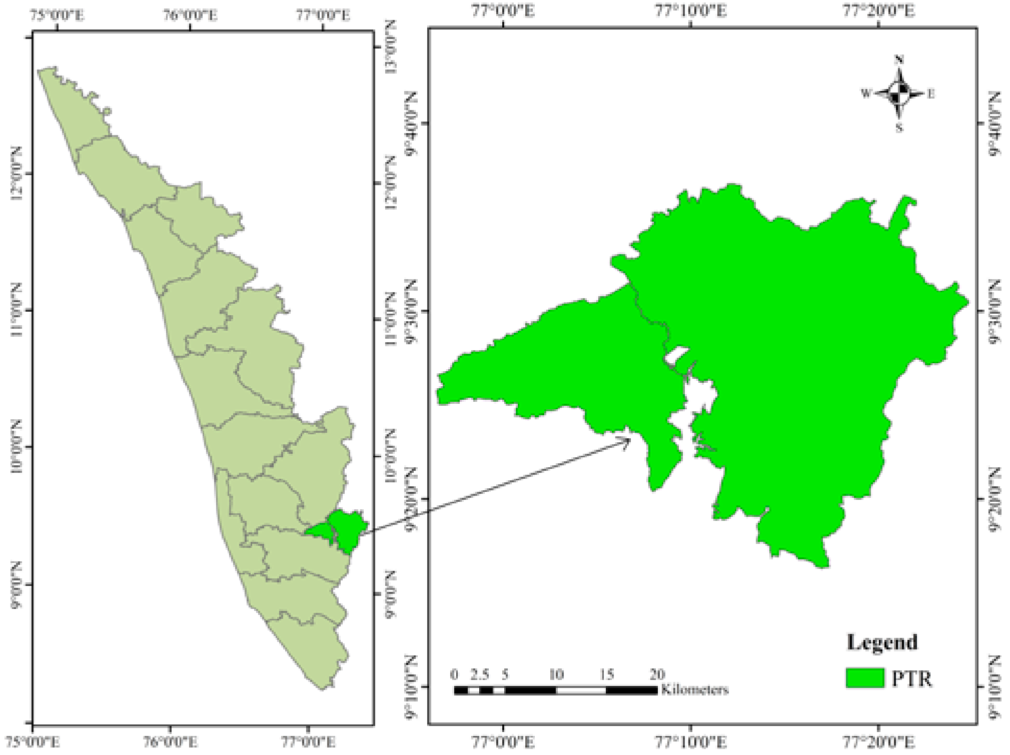
1. INTRODUCTION

The Periyar Tiger Reserve (PTR) is the largest protected area in Kerala and is part of the highly successful Project Tiger, a national conservation initiative that has been operational for over 50 years. This programme has enabled India to host approximately 75 percent of the world's wild tiger population, with numbers rising from 2 967 in 2018 to 3 167 in 2022 (Qureshi *et al*., 2023). Human interventions in Periyar Valley started with the construction of the Mullaperiyar Dam across the Periyar River, leading to the creation of a reservoir in 1895. Due to the rich forests and wildlife, the Maharaja of Travancore declared the forests around the lake as the Periyar Lake Reserve, enabling their protection as hunting grounds.

The reserve was declared the Nellikkampetti Game Reserve in 1934, with 50 000 ha; by 1950, it had expanded to 77 700 ha and was called the Periyar Wildlife Sanctuary. The core area of the sanctuary, an area of 35 000 ha, was declared a national park in 1982. In 2007, an extent of 88 100 ha was deemed as the core or critical tiger habitat of PTR. At the present time, PTR has a total area of 92 500 ha (Shukla, 2012).

The reserve has been an important tourist attraction thanks to its lake and surrounding forest. In addition to tourism, Sabarimala temple inside the reserve is a pilgrimage site with an annual footfall of over 5 million pilgrims from November to January each year. Apart from the excellent protection this area has received, it has gained attention for its use of several innovative management methods. The “India Ecodevelopment Project” funded by the Global Environment Facility and the World Bank focused management attention on sustainable tourism activities that ensured local participation. People involved in illegal activities such as debarking cinnamon trees, sandalwood smuggling and wildlife poaching were organized as an ecodevelopment

Figure 1. *The location of Periyar Tiger Reserve in the state of Kerala, India*



Source: Author's own elaboration

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

committee in 1998, and their familiarity with the terrain was used for tourism purposes.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

Initially focused on strict wildlife protection, the reserve has transitioned to a more holistic management approach, encompassing community involvement, sustainable development, enhanced biodiversity conservation, partnerships, collaboration, and education and awareness.

Separate objectives were established for the core and buffer zones. The primary objective for the core area is to preserve the tiger population and safeguard the rich biodiversity, especially endangered, rare and threatened species.

In the buffer area, a more inclusive approach to conservation was adopted, aiming to balance conservation goals with socioeconomic needs. Following the implementation of the India Ecodevelopment Project from 1996 to 2005, the management objective focused on involving local communities in conservation efforts, promoting ecotourism and sharing the benefits of a healthy ecosystem. This approach supports sustainable livelihoods while encouraging eco-friendly pilgrimage routes to minimize wildlife disturbance and promote responsible ecotourism (Kerala Forest and Wildlife Department, 2021).

2.2. Type and condition of forest and scale of operation

Periyar Tiger Reserve and its adjoining forests form the most extensive intact vegetation of the Western Ghats in peninsular India and are vital in maintaining ecological connectivity in this area of otherwise fragmented forest tracts (Veeramani *et al*., 2023).

The reserve encompasses diverse ecosystems, ranging from tropical evergreen forests and montane wet temperate forests to marshes and grasslands. Grasslands and marshes are prime grazing grounds for various herbivores, creating a vibrant predator–prey dynamic. Marshy grasslands, known locally as *vayals*, represent a unique and ecologically diverse ecosystem within PTR, with 140 identified *vayals* harbouring an array of flora and fauna (Kerala Forest and Wildlife Department, 2021).

Periyar Tiger Reserve includes an area of 93 530 ha, with a total forest cover of 84.12 percent (17 605 ha of very dense forest, 50 051 ha of medium dense forest, and 11 025 ha of open forest). There was a net loss of 2 137 ha of forest between 2011 and 2021 (Forest Survey of India, 2021). The current assessment also identified 2 637 ha of wetlands, which is 2.82 percent of the total area of PTR.

Merin (2023) observed a steady increase in green vegetation cover in PTR between 2000 and 2020, with the normalized difference vegetation index value increasing from 0.53 to 0.61. The dense forest patches within PTR also increased in area and there was decreased fragmentation in the core and buffer areas over the same period (**Figure 2**).

The study also observed a moderate decrease in open forest. The vegetation changes and increase in normalized difference vegetation index indicate that this tiger reserve area is dynamic and healthy (see Section 2.8 for further details).

2.3. Legal status and management structure

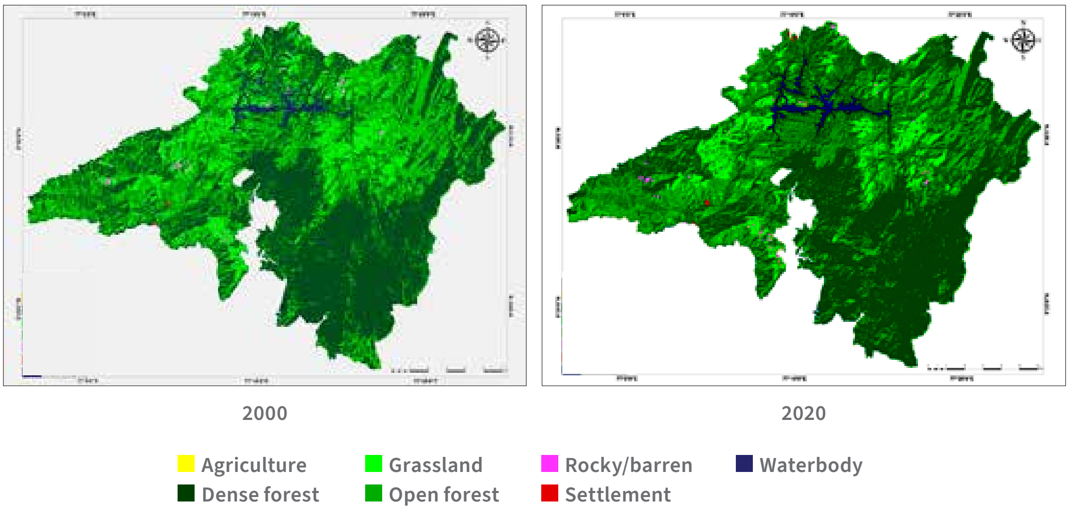
Periyar Tiger Reserve's institutional and management framework is designed to safeguard tigers and their habitat while sustaining the livelihoods of the communities around the reserve's fringes. There has been no significant change in the legal status and management structure since the last review.

The PTR landscape comprises both protected and non-protected areas in the states of Tamil Nadu and Kerala. The core and buffer areas within the PTR's protected zones fall under the administrative control of the Field Director of Project Tiger. Periyar Tiger Reserve is divided into five territorial ranges: Thekkady, Vallakkadavu, Periyar (Periyar East Division), Azhutha and Pamba (Periyar West Division).

Various committees have been established to manage and monitor the reserve effectively:

- Tiger Steering Committee – a 15-member committee led by Kerala's Chief Minister to

Figure 2. *Land use and land cover analysis of Periyar Tiger Reserve (2000–2020)*



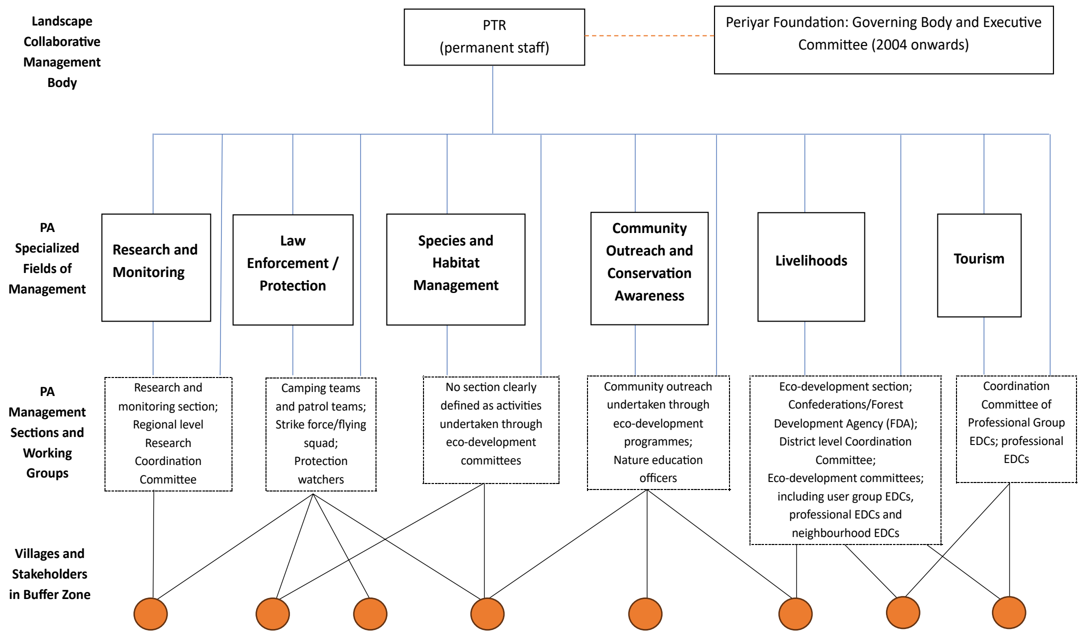
Source: Merin, P.M. 2023. *Landscape fragmentation analysis using geospatial tools in Periyar Tiger Reserve, Kerala.* Thrissur, India, Department of Natural Resource and Management, College of Forestry.Master's thesis.
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

aid in tiger and biodiversity conservation management. It initiates ecodevelopment projects involving local residents' participation in the development process.

- Periyar Tiger Conservation Foundation (PTCF) – a semi-autonomous trust that supports tiger reserve administration, biodiversity conservation, ecodevelopment and research through a dedicated team including conservation experts, ecologists, educators and sociologists under the chairmanship of the State's Forest Minister.
- State-level Monitoring Committee – a nine-member committee chaired by the Chief Secretary of the State to facilitate coordination and mainstream wildlife concerns in the State.
- Buffer Area Coordination Committee – a 13-member committee headed by the Field Director of PTR to review the implementation of the prescriptions in the Tiger Conservation Plan for the buffer zone.
- Confederation of Eco-development Committees – a confederation overseen by a general body of representatives from all of PTR's Eco-development Committees (EDCs), who share ideas and experiences, and advocate for local communities.
- Village EDCs – the lowest level of community-based organizations that support tiger conservation and habitat protection through ecodevelopment planning and implementation. The general body of an EDC consists of two members per household, representing men and women, governed by an executive committee having representation of women, scheduled castes and scheduled tribes. The EDCs are categorized into four functional groups depending on their mode of operation: Neighbourhood EDCs; Professional EDCs; User Group EDCs; and Pilgrim Management EDCs.

Periyar Tiger Reserve staff are organized into the specialized management teams shown in **Figure 3**.

Figure 3. *Multi-level collaborative management arrangements in Periyar Tiger Reserve*


Landscape Collaborative Management Body
PTR (permanent staff)
Periyar Foundation: Governing Body and Executive Committee (2004 onwards)
PA Specialized Fields of Management
Research and Monitoring
Law Enforcement / Protection
Species and Habitat Management
Community Outreach and Conservation Awareness
Livelihoods
Tourism
PA Management Sections and Working Groups
Research and monitoring section; Regional level Research Coordination Committee
Camping teams and patrol teams; Strike force/flying squad; Protection watchers
No section clearly defined as activities undertaken through eco-development committees
Community outreach undertaken through eco-development programmes; Nature education officers
Eco-development section; Confederations/Forest Development Agency (FDA); District level Coordination Committee; Eco-development committees; including user group EDCs, professional EDCs and neighbourhood EDCs
Coordination Committee of Professional Group EDCs; professional EDCs
Villages and Stakeholders in Buffer Zone

Source: Parr, J.W. 2015. Institutional analysis of multi-level collaborative management in Periyar Tiger Reserve, Southern India. *IUCN PARKS*, 21: 37–50.

2.4. Regulatory environment and government support

Periyar Tiger Reserve operates under various laws including the Wildlife (Protection) Act (1972), Forest (Conservation) Act (1980), Environment (Protection) Act (1986), Biological Diversity Act (2002) and Kerala Forest Act (1961). These laws form the basis for protecting the reserve's wildlife, forests and biodiversity. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act (2006) granted rights to forest dwellers near the reserve, allowing access to minor forest produce, grazing and cultural practices in the buffer area.

Policies such as the National Forest Policy (1988) and Kerala State Environment Policy (2009) emphasize community involvement in forest management. Successful conservation and livelihood programmes at PTR, serving as global models, owe their success to timely policy implementation. The reserve aims to restore 5 500 ha of eucalyptus plantations to grasslands, aligning with India's commitment to restore 26 million ha of degraded land by 2030 under the Bonn Challenge (Kerala Forest and Wildlife Department, 2021).

The Government of India provides financial and technical aid to PTR for diverse aspects including conservation, habitat management, wildlife monitoring, tourism, research, community outreach and education. This assistance extends to fostering sustainable livelihoods for nearby communities. Government regulations and support have been pivotal in PTR's conservation achievements. Kerala's Ecorestoration Policy (2021) aims to revive degraded forest areas by planting native species, safeguarding water sources and soil, conserving biodiversity, and offering employment to local forest-dependent communities. Ecorestoration efforts in grasslands and *vayals* stand to benefit significantly from this policy.

2.5. Forest management practices

Periyar Tiger Reserve has been recognized as India's best-managed tiger reserve (Yadav *et al*., 2023), where the forest department and local communities collaborate in forest management. When the reserve was established in 1978, poaching and smuggling were prevalent crimes, posing a severe threat to the flora and fauna. The establishment of EDCs, a new model of community participation, immensely helped in curbing these illegal activities. Over the years, this model evolved to become a signature of PTR (Bharadwaj *et al*., 2006). Many former poachers and smugglers were made gamekeepers, thereby strengthening forest protection while also improving the livelihoods of these people.

The primary focus of reserve management was and is to curb illegal activities and preserve biodiversity. This objective is executed according to the guidelines and schedule outlined in the management plan, which undergo revisions every ten years based on perceived threats and their severity.

To enhance reserve management, anti-poaching camps, watch towers and temporary camps were set up in critical areas. Intelligence gathering and coordinated efforts among forest officials have formed a well-organized network to detect illegal activities promptly. Community-based and protection-oriented ecotourism programmes have been established to combat sandalwood smuggling, animal poaching, illegal tree-felling and forest fires. Scheduled patrolling at illegal entry points and other vulnerable areas is conducted by the Strike Force and Flying Squad (Special Protection Teams).

To manage and improve the habitat in PTR, silvicultural practices – such as weeding, clearing grasses and controlled burning – are conducted annually in parts of the reserve. These activities help reduce the risk of sudden wildfire and aid in the regeneration of indigenous species.

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A herd of elephants in the Periyar Tiger Reserve

2.6. Production and business aspects

Periyar Tiger Reserve's ecosystem services include gene pool protection (valued at approximately USD 97.3 million yearly), water provision to neighbouring districts (valued at USD 50.6 million), wildlife habitats and refugia (valued at USD 44.4 million) and annual carbon sequestration (valued at USD 2.26 million). Other services include gas regulation, nutrient cycling and waste assimilation (Kerala Forest and Wildlife Department, 2021). Chacko *et al.* (2019) quantified the sediment retention ecosystem services in the mountainous landscape of Periyar and found a high sediment retention value for evergreen forests, followed by semi-evergreen.

Incentive-based market approaches for conserving PTR's ecosystem services offer sustainable prospects. Verma *et al.* (2017) estimated the total annual economic value of PTR's ecosystem services to be USD 266 million. This includes 10 percent for local communities, 52 percent for the national government and 38 percent for the global community. The study also found that every rupee spent on PTR's management yields flow benefits of approximately USD 6.92 within and outside the reserve. This underscores PTR's positive economic impact and calls for investment in its conservation.

As a renowned ecotourism destination in Kerala, PTR experienced a steady increase in visitors from 1991 to 2014. Between 2012 and 2013, the revenue collected was approximately USD 2.1 million, which increased to USD 109 million by 2019/2020. Despite the rise in income over the years, there has been a decline in the number of visitors, dropping from 958 000 visitors in 2013/2014 to 406 000 visitors in 2019/2020 (Kerala Forest and Wildlife Department, 2021).

2.7. Social aspects and impacts

Between 20 000 and 30 000 people near PTR depend significantly on the reserve for their livelihood. Approximately 5 000 individuals from tribes such as Malampandaram, Malarayan, Mannan, Paliyan, Ulladar and Urali share deep ecocultural connections with the Periyar forests. Both tribal and non-tribal communities in the buffer zone rely on the reserve for resources like firewood, fish, black dammar, thatching grass, fodder grass, poles, bamboo and reed, and honey, using some for personal needs and others for sale. Ecodevelopment initiatives have focused on addressing these dependencies since 1997.

The implementation of the India Ecodevelopment Project brought about a notable transformation in the livelihoods of forest-bordering communities. The project, as highlighted by Damayanti and Masuda (2008), led to a shift from reliance on forest-based activities to more independent pursuits by introducing EDCs and community-based and protection-oriented ecotourism programmes (Mathew *et al*., 2012)

These initiatives also brought about social and cultural empowerment, strengthened trust, and enhanced self-esteem and sense of community belonging (Bhardwaj *et al*., 2023). They involved exoneration from prior criminal charges, co-management and relaxed access restrictions, resulting in improved livelihood security within the reserve. These improvements have provided better access to education and healthcare, as well as have enabled communities to have a stronger voice in conservation and development decisions through inclusive governance and collaboration.

The EDCs have ensured social equity and gender empowerment by providing equal representation to women and members of lower social strata (Kerala Forest and Wildlife Department, 2002). Women's active participation in ecotourism activities has significantly empowered the community. For instance, Vasanta Sena, an all-women EDC patrolling PTR's fringe area, has received awards, including the P.V. Thampy Memorial Endowment Award in 2003 and the Amrita Devi Environmental Award in 2006, for their dedicated efforts in protecting the area (Bhardwaj *et al*., 2023).

2.8. Environmental values and impacts

Periyar Tiger Reserve stands out as Kerala's most biodiverse protected area, housing over 41 percent of the State's plant species. It hosts 823 genera and 151 families of plants, with around 26 percent being endemic to the Western Ghats (Sasidharan, 1998). The reserve boasts diverse fauna, including

A tiger in the Periyar Tiger Reserve

©PERIYAR TIGER CONSERVATION FOUNDATION/KERALA FOREST DEPARTMENT endemic mammals, birds, reptiles, amphibians and fish, surpassing other protected areas in Kerala in faunal richness.

The reserve hosts 68 percent (66 species) of Kerala's non-marine mammals and 65 percent (323 species) of its avian diversity. It houses 68 reptile species, with 27 being Western Ghats endemics. Among these reptiles, 11 are threatened species on the International Union for Conservation of Nature Red List, and 40 are protected under the Wildlife (Protection) Act 1972. Additionally, 56 of the 64 amphibian species in the reserve are endemic to the Western Ghats. Periyar Tiger Reserve's lakes and streams are home to 54 fish species, including several endemic to the reserve.

In addition to vertebrates, PTR boasts diverse invertebrate species: 247 butterfly species, 37 moth species, 35 dragonfly species, 31 species of wasps, bees and ants, 47 hemipterans, and 27 beetle species (Radhakrishnan and Kurup, 2010; Rajkumar *et al*., 2018).

The tiger, a keystone and umbrella species in PTR, significantly contributes to its diversity. As per the latest 2022 report on India's tiger population, PTR is home to 31 tigers, with a density of 1.43 tigers per 10 000 ha (Qureshi *et al*., 2023). This population has increased from the 2014 estimation of 20 tigers and the 2018 count of 26.

2.9. Challenges and threats

Periyar Tiger Reserve is a haven for diverse flora and fauna but faces many challenges, such as encroachment, poaching, habitat fragmentation and climate change. These challenges pose a significant threat to the ecosystem's delicate balance, jeopardizing the survival of endangered species and the reserve's integrity. Addressing these challenges and ensuring PTR's long-term viability requires a concerted effort from all stakeholders, including the government, local communities and conservation organizations.

Other critical challenges faced by PTR are numerous and include: inadequate modern infrastructure and equipment; lack of access to important areas during the monsoon season; inadequate facilities for camping in the interior areas; the presence of private estates and leased areas inside the core zone; power lines through the forest; the invasion of woody species in grasslands and marshy grasslands; exotic weeds; frequent transfers of frontline staff; the lack of registration of licensed gun holders within a 10 km radius of the protected area boundary; eucalyptus plantations; the sizeable pilgrim populations that pass through the reserve annually; and the collection

Pilgrims hiking into the forest

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of non-timber forest products (Kerala Forest and Wildlife Department, 2021).

Achieving effective coordination between stakeholders and agencies is another challenge. This involves fostering coordination and mutual support between the EDCs and the forest department, as well as between the forest departments of Kerala and Tamil Nadu, given that PTR's forests form a continuous landscape with the forests of the adjacent Tamil Nadu state.

The reserve faces numerous threats, including illicit activities (e.g. smuggling and ganja cultivation), uncontrolled fires, grazing, disease transmission, human–wildlife conflict, urban expansion, dam-related issues, pollution and invasion of alien plant species (Kerala Forest and Wildlife Department, 2012; Kerala Forest and Wildlife Department, 2021).

2.10. Opportunities

Periyar Tiger Reserve offers a unique opportunity to implement or advance sustainable forest management practices, including:

- involving local communities in conservation efforts through EDCs;
- establishing clear interstate collaboration guidelines for tiger reserve management;
- providing emergency financial aid through the PTCF;
- using the reserve for environmental education and extension programmes;
- conducting further ecological research and management studies;
- fostering market support for EDC products;
- planning the management of the Sabarimala pilgrimage;
- obtaining legal authorization for an ecosensitive zone declaration;
- enhancing ecotourism facilities within the reserve;
- implementing an online booking system for community-based ecotourism;
- elevating PTCF to a State Centre of Excellence;
- developing new ecotourism programmes both inside and outside the reserve;
- designing new trails (e.g. a wetland birding trail); and
- creating premium tourist packages using existing infrastructure at low intensity.

2.11. Partnerships

Periyar Tiger Reserve has broadened its partnerships beyond government agencies, involving NGOs such as the World Wide Fund for Nature, Ashoka Trust for Research in Ecology and the Environment, Wildlife Trust of India, Wildlife Protection Society of India, and Wildlife Conservation Trust. This broader approach has led to more diverse perspectives and expertise being brought to bear on managing the reserve. Collaborations now include local communities, EDCs, scientists, universities, media, tour operators, corporations and planters. All of these collaborations expand and disseminate knowledge, contributing to PTR's success (Kerala Forest and Wildlife Department, 2021).

Periyar Tiger Reserve aligns with the Global Tiger Forum and the Tigers United University Consortium in tiger conservation. This coalition, comprising United States universities (such as Clemson, Auburn, Louisiana State, and the University of Missouri), pools resources to safeguard wild tigers. The collaborative focus has shifted from financial aid to technical and capacity-building support, empowering PTR to enhance management capabilities for better conservation outcomes.

2.12. Research, education, innovation, recognition and outreach

Research

Periyar Tiger Reserve is extensively studied, boasting a presence in over 330 research publications on biodiversity and conservation strategies. The Conservation Biology Wing of the Periyar Foundation leads long-term and short-term research on PTR and its environment. Studies of PTR revolve around human–wildlife conflict, ecodevelopment, the Sabarimala pilgrimage, climate change and community-based ecotourism. Research extends to population dynamics, applications for geographic information systems and tourism economics in PTR.

Education

Periyar Tiger Reserve provides educational activities for field staff and EDC members, covering wildlife techniques, biodiversity assessment, habitat management, geographic information systems and crime investigation, among other topics. Workshops on ecodevelopment, organic farming, health and hygiene are also held. Exposure visits focus on participatory rural development. These initiatives aim to enhance knowledge and skills and promote conservation and sustainable development in the reserve.

Innovation

Periyar Tiger Reserve has deployed two Android-based applications to enhance tiger and snake conservation efforts. MSTrIPES, developed by the Wildlife Institute of India, facilitates tiger tracking and data collection by field staff. SARPA Android streamlines snake rescue from human settlements, raises public awareness about snakes, and guides snakebite management.

Awards and recognitions

Periyar Tiger Reserve has been recognized for its conservation efforts with many awards and acknowledgements, including the Conservation Assured Tiger Standards accreditation (2023); a Management Effectiveness Evaluation, ranking first with a score of 94.38 percent (2022); the National Tiger Conservation Authority Award for Excellence in Performance in Anti-Poaching (2022); the Skål International Award (2019); the Sanctuary Asia Award for Outstanding Individual Performance in Wildlife Conservation (2017); the National Tiger Conservation Authority Award for Excellence (2016); the India International Travel Mart Award for Best Nature Destination (2015); the World Wide Fund for Nature–Pacific Asia Travel Association Bagh Mitra Award (2014); the United Nations Development Programme's India Biodiversity Awards (2012); and the Best EDC Award (2007).

Outreach

Periyar Tiger Reserve engages in various outreach activities to promote awareness of the reserve's significance and to encourage protective actions. These activities include educational workshops, nature camps, fire prevention campaigns, teacher training programmes, national-level nature awareness workshops, and exposure visits for various stakeholders. Additionally, PTR hosts academic fora, folk theatre performances and environmental awareness campaigns, publishes the EDC newsletter *Sahajeevanam* (Co-existence), and maintains its own website. These outreach initiatives aim to reach a broad audience, improve connections with local communities and stakeholders, and promote reserve protection.

3. KEY LESSONS LEARNED

The quality of planning and management in PTR has gained global recognition thanks to strong government commitment, stakeholder involvement, the use of sound scientific data, and effective implementation of policy. Management has evolved to adapt to changing conservation needs and community engagement.

The following key conservation lessons are drawn from PTR.

- Biodiversity conservation through protected areas: Strict regulations and conservation policies provide a haven for tigers, elephants and endangered species.
- Community engagement and support: Involving local communities in conservation efforts through community-based programmes helps foster local support and addresses the needs of the communities.

- Ecotourism for conservation: Effective ecotourism practices generate revenue for conservation and raise awareness about preserving natural habitats.
- Water resources management: Sustainable water resources management in the Periyar River ensures the ecosystem's health and supports downstream communities.
- Anti-poaching and law enforcement: Emphasizing and enforcing anti-poaching measures has significantly protected wildlife in the reserve.
- Research and monitoring: Ongoing research and monitoring are crucial for understanding the ecosystem and guiding conservation strategies.
- Sustainable forestry practices: Balancing conservation with sustainable forestry practices supports wildlife and local livelihoods.
- Collaboration and partnerships: Collaboration among government, NGOs and local communities enhances conservation efforts and promotes their sustainability.
- Education and awareness: Educational programmes and outreach efforts in PTR inspire environmental stewardship, especially among the younger generation.

These lessons from PTR provide valuable insights into successful conservation strategies and serve as a source of inspiration for other protected areas and conservation initiatives worldwide.

The Periyar model is a successful example of conserving biodiversity while enhancing local livelihoods. The India Ecodevelopment Project (1996-2005) aimed to engage nearly 60 000 people residing within 2 km of the park boundary in integrated conservation and development projects. Through consultations, 78 EDCs were formed and classified based on traditional skills, knowledge and professions. These EDCs ensured livelihood options for the stakeholders while also ensuring the protection of the reserve. After this initiative, the Kerala government set up the Periyar Foundation in 2004 to be run as a government-owned trust and continue the work begun under the Global Environment Facility-funded project. The success of the Periyar Foundation paved the way for an amendment to the Indian Wildlife (Protection) Act directing all tiger reserves to constitute such foundations, and the PTCF was formed in 2012.

The success of Periyar attracted much attention and has been replicated in many other tiger reserves and protected areas nationwide. It is a worthy model for emulation around the globe where local livelihood security is in direct conflict with protected area management.

4. FUTURE OUTLOOK

Periyar Tiger Reserve's future outlook is promising but at the same time challenging. The reserve has several strengths, mainly its strong track record of conservation success, dedicated and experienced staff, and strong support from the local community, all of which bode well for its future. Nevertheless, there are a few challenges, including human–wildlife conflict, minor poaching incidents and wildlife trafficking. Human–wildlife conflict is a growing issue that needs to be articulated in the reserve's management objectives. The reserve fosters a strong commitment to conservation among all stakeholders. With continued support, PTR can remain a sanctuary for tigers and other wildlife, while also providing improved livelihood support for communities living along the forest's edge.

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ASIA-PACIFIC

COMMUNITY-BASED DAMAR TREE MANAGEMENT IN PESISIR BARAT: CHALLENGES AND PROSPECTS IN A CHANGING LANDSCAPE

Gamma Galudra and **Reny Juita**, RECOFTC Indonesia

NAME OF FOREST	**Repong damar**
LOCATION	**Pesisir Barat Regency, Lampung Province, Indonesia**
AREA (ha)	**29 000**
MANAGING ENTITY	**Local community under the customary law of Bengkunat; Community Plantation Forest Cooperatives**
MANAGEMENT OBJECTIVES	**Preserving traditional agroforestry practices and cultural heritage; maintaining and supporting the economic sustainability of local communities and land ownership; promoting biodiversity**
FOREST TYPE	**Planted forest dominated by damar (*Shorea javanica*)**

1. INTRODUCTION

The term “repong damar” is used by the Krui community to refer to man-made forests dominated by damar trees (*Shorea javanica*). It also refers to the community-based agroforestry and forest management practised in these forests, rooted in traditional management practices and knowledge. It holds significant cultural and economic value for local communities. Covering an extensive area of approximately 29 000 ha, repong damar forests are primarily situated in Pesisir Barat Regency, Lampung Province, in southern Sumatra. They serve as buffer zones and protective areas for the Bukit Barisan Selatan National Park (TNBBS), contributing to the conservation of biodiversity (Lensari and Yuningsih, 2018).

Local knowledge has played a pivotal role in safeguarding the sustainability of repong damar over generations, with the regular extraction of damar resin and avoidance of indiscriminate tree felling (Anasis and Sari, 2015). The knowledge passed down from the ancestors of the community is enriched by each succeeding generation, equipping the local communities and damar cultivators with the expertise required for the propagation, cultivation, maintenance and harvesting of damar trees (Budidarsono *et al.*, 2000). This case study explores the role of repong damar in biodiversity conservation and community-driven forest management, as well as challenges and opportunities that the Krui community faces while maintaining traditional practices in a changing economic landscape.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

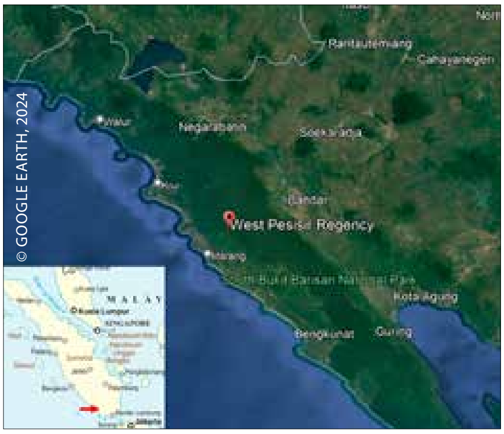
The objectives of repong damar management by the Krui community remain unchanged: to preserve their traditional practices and cultural heritage; and to ensure the sustainability of their livelihoods. The cultivation of damar trees provides a reliable source of income for the community. By maintaining ancestral customs and continuing damar cultivation, they also assert their ownership claims over the land, thereby reducing the risk of potential land disputes (Kusters *et al.*, 2007). Traditionally, community members who cleared the forest and planted damar trees could assert individual ownership over that plot of land.

Yet, this objective has faced significant threats arising from inconsistent government policies, inadequate support and facilitation from governmental and external entities, and the growing interest in more lucrative economic opportunities such as oil palm cultivation and other alternative land uses.

2.2. Type and condition of forest and scale of operation

Repong damar extends along the coastline of Pesisir Barat Regency, stretching from Malaya in the north to Bengkunat Belimbing in the south. Of the total area of approximately 29 000 ha, around 8 000 ha have been converted into Community Plantation Forest (HTR) status, and 21 000 ha remain community-owned repong damar (Anasis and Sari, 2016).

Figure 1. *Pesisir Barat Regency, Lampung, Indonesia*



Source: Google. n.d. *Google Earth*. [Cited 18 December 2024]. https://earth.google.com/web. United Nations. n.d. Geospatial, location data for a better world. [Cited 18 December 2024].

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

Over the last decade, the extent of repong damar has declined, shrinking from 17 500 ha in 2011 to 10 298 ha in 2014, and further to 6 510 ha in 2022 (Hadiyan, 2015; KKPH Pesisir Barat, 2023). The proportion of mature damar trees within the repong damar area has also decreased, from 65 percent in 2000 to 51.5 percent per ha in 2014 (Hadiyan, 2015). The decline is attributed to the altered legal status of the land from a Special Purpose Zone (*Kawasan Dengan Tujuan Istimewa*, or KDTI) to HTR, as well as the conversion of repong damar into more lucrative crops such as oil palm.

2.3. Legal status and management structure

Several significant events have served as historical milestones influencing the land rights and tenure access of the Krui community to their repong damar:

1. Recognition of Krui community as the indigenous population or "*inlandsche gemeente*" by the Dutch colonial government in 1932. In this agreement, the communities ceded some of their land located in the Bukit Barisan mountain range to the Dutch government to establish a hunting area. This agreement included certain exceptions and special rights for the communities, allowing them to continue collecting damar resin in conservation areas.
2. The Forest Land Use Agreement of 1991.[1] This agreement designates the community's repong damar land as protection forests and limited production forests in the buffer zone of TNBBS.
3. The designation of repong damar as KDTI through a ministerial decree.[2] This status classifies the forest as protective areas, granting special management rights to the community. The Lampung Provincial Government acknowledged and affirmed that the Krui community is a customary law institution. Around 16 local customary groups received the KDTI management rights.

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[1] Minister of Forestry Decree No. 67/Kpts-II/1991

[2] Minister of Forestry Decree No. 47/Kpts-II/1998

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Tapped damar trees

4. In 2008, around 8 000 ha of forest within the repong damar's management experienced a change in legal status (from KDTI to HTR), creating confusion in the community. The HTR's objective is to support industrial tree plantation development. This objective is not in line with the traditional repong damar management practices, which focus on agroforestry and non-timber forest products. It is estimated that around 30 percent of the land has been planted with commercial timber trees such as *Acacia*, altering the land use system of repong damar.

2.4. Regulatory environment and government support

Under the HTR scheme, the government has helped the community to set up eight farmers' cooperatives. Both the government and private entities play a dominant role in governing HTR cooperatives. They influence decisions related to membership selection, work planning, management and profit-sharing within the HTR system. Each cooperative received Indonesian rupiah (IDR) 2.5 billion (USD 159 408)[3] from the government for land management and seedling cultivation. The community also received government support for equipment, capacity building, land management and business entrepreneurship.

The HTR's objectives of promoting commercial timber trees have the potential to disrupt established norms and customary damar management practices. Moreover, the HTR introduces government-imposed regulations and requirements. In contrast, under the KDTI scheme, the government officially acknowledged and recognized the traditional repong damar management practices of the Krui communities.

A member of one cooperative stated,

> *Communities are traditionally used to working on their land independently and do not fully understand the differences in land use permits. Around 2010, there was an official notification that the land permit had been held by the cooperative under a new scheme, the HTR. The communities were required to register as members of the cooperative so they could continue working on the land. Community members got angry. Some registered for the cooperative, but more persisted in customary land-use. This continues until now.*

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[3] USD 1 equals IDR 15 683 (8 November 2023).

2.5. Forest management practices

To date, the management of damar trees in Pesisir Barat Regency has been a three-phase process, which reflects a balance between traditional practices and modern realities.

- The *darak*, or clearing phase, marks the start of damar tree management. During this phase, damar farmers begin the process of opening the forest over a period of two to three months.
- The second phase, known as the *kebun* or farming phase, begins when farmers prepare seedlings of damar and other crop trees, such as *petai* (*Parkia speciosa*), *jengkol (Archidendron pauciflorum*) and durian, for planting. This phase typically takes two to three months.
- The third phase, known as the *repong* or agroforestry phase, involves gradually increasing the diversity of plants within the repong area. It is believed that waiting for 15 years or more before tapping damar trees results in higher resin yield and improved quality. Some trees will produce a high-value, clear resin known as *damar mata kucing*, which commands a premium price in the market.

In addition, the communities continue traditional and customary practices, such as performing resin extraction rituals two to three times per week, protecting young damar trees by enforcing traditional laws that prohibit the cutting or felling of trees less than 15 years old, and replanting to replace fallen or felled damar trees.

However, repong damar management in the Bengkunat sub-district, located in the southern part of Pesisir Barat Regency, is currently under threat from the change in land status to HTR and the presence of sawmills in the area. Around 30 percent of the HTR land under repong damar management has already been planted with commercial timber species. Additionally, some community members have been found selling their productive damar trees to sawmills for quick cash (Gilbert and Setyaka, 2022).

2.6. Production and business aspects

Agroforestry damar cultivation in the region yields an annual production of approximately 6 720.2 tonnes (Bappeda Pesisir Barat, 2016).

Pesisir Barat Region stands as the largest producer of damar resin in Indonesia, accounting for approximately 80 percent of the national production for export. Primary export destinations include Bangladesh, Belgium, France, Germany, India, Italy, Pakistan, the Philippines and the United Arab Emirates. This versatile resin serves a multitude of purposes, including its use as an ingredient in paints, incense, perfumes and cosmetics.

Damar resin can be harvested every three to four weeks from each tree, with an average annual

Damar resin

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Farmer collecting damar resin

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Damar tree landscape in Malayar village

yield of 35 to 50 kg from 10 to 12 damar trees under favourable conditions. Typically, 1 ha can yield between 1 500 and 5 000 kg of resin per year.

In the marketing process, damar farmers typically sell their resin directly to village-level collectors. Information regarding the whereabouts of these collectors is often shared among fellow damar farmers. The grading of damar resin is usually carried out at village-level collection points, where it is also weighed and transported to village-owned warehouses. However, the price at the village level is set by large traders or agents, most of whom are based in Jakarta or Bandar Lampung. As a result, local communities remain uncertain about the domestic and global market values.

A 2021 study in the Central Pesisir sub-district found that farmers earned an annual income of IDR 48 657.13 (around USD 3 200) from repong damar cultivation (Andika *et al.*, 2021). The highest recorded price for damar resin was IDR 30 000/kg (around USD 2/kg) in 2020, while the lowest was IDR 9 000/kg (around USD 0.6/kg) in 2022. Since 2022, damar resin prices have risen slightly, with the average selling price ranging between IDR 12 000 and IDR 15 000/kg (between USD 0.75 and USD 1/kg). This price fluctuation was primarily driven by changes in global demand.

Local communities share a common concern about declining market prices, which have resulted in reduced income for cultivators. In response, they harvest resin from each tree more frequently, at intervals of less than a month or even a week, which in turn reduces the quality of the resin. In extreme cases, residents have sold ancestral damar trees to timber operators, while others have explored alternative livelihood options, such as planting rubber trees or oil palm on their land.

2.7. Social aspects and impacts

Around 80 percent of the population in Pesisir Barat relies on damar forests for their livelihoods. Individuals can earn income from damar trees in various ways, including tapping damar resin, drilling

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Farmer collecting sap in a repong damar

holes in the trees for sap to exit and collecting fallen resin under the trees. Through these various roles, nearly every household or household member, whether or not they own damar tree plots, has opportunities to benefit from damar trees. Even if a family does not inherit damar tree plots, they can engage with damar trees through practices such as sharing cultivation for a portion of the yield, taking damar trees as collateral, working as hired harvesters or renting damar tree plots (Liberti, 2013).

The presence of palm oil companies that have obtained location permits from the government has resulted in the clearing and conversion of repong damar forests into oil palm plantations. These companies have extensively cleared the Krui community's repong damar in four villages within the designated KDTI area. The community's resistance to these companies has weakened over time due to the erosion of customary institutional functions, driven by government policies that recognized customary institutions but failed to acknowledge their customary territories and rights.

A member of one of the villages stated,

> *In recent months, several meetings and discussions were held with the provincial government regarding land permits to palm oil companies, which has led to conflicts. These meetings ended with a recommendation to revoke the permits and return the land directly to the community. Currently, there are no further steps from the government to revoke the permits.*

2.8. Environmental values and impacts

Damar agroforestry practices in Lampung's Pesisir Barat Regency have fostered diverse and multi-layered vegetation, as highlighted by Santoso *et al.* (2023). This diversity is shaped by the systematic planting of different species undertaken by local farmers within the repong damar system as well as by natural regeneration. The upper canopy,

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[4] E.g. *Pterospermum javanicum*, *Pangium edule* and *Phoebe angustifolia*

reaching 40 metres in height, is dominated by productive damar trees and also features fruit trees such as durian, *petai* and mango, as well as several timber species.[4] The lower canopy includes fruit trees such as mangosteen, langsat, rambutan and guava. In addition to economic value, this rich plant diversity provides habitats for wildlife, including gibbons, long-tailed macaque, *cecah* (black-crested Sumatran langur), grey langurs, bats and others. However, population growth in the surrounding areas and associated activities pose a threat to wildlife (Doria *et al.*, 2019).

Damar trees play a crucial role in preventing soil erosion and landslides. The canopy intercepts rainwater, reducing the amount of water that reaches the soil at a point in time. In addition, the extensive root systems of damar trees anchor the soil, reducing soil movement and enhancing soil stability. Evapotranspiration helps reduce soil saturation, preventing water buildup above impermeable layers that could trigger shallow landslides.

Ecologically, the developmental stages of repong damar closely resemble natural succession, providing various ecological benefits like soil conservation and microclimate regulation, among others. The cultivation of productive plants in repong damar, from subsistence crops to mature trees, occurs within an ecologically suitable and mutually supportive framework (Michon *et al.*, 2000). The importance of repong damar in Krui thus extends beyond its economic contributions to playing a key role in biodiversity conservation, soil protection and the environmental stability of the area (Taufiq *et al.*, 2023).

Converting repong damar into oil palm and industrial tree plantations will likely have detrimental effects on wildlife habitats and diminish the ecological benefits associated with damar trees. The absence of specific studies addressing this scenario highlights a knowledge gap. The potential risks to the ecosystem need further research and consideration in forest policy.

2.9. Challenges and threats

Over the years, there has been a decline in the extent and sustainability of damar cultivation in Pesisir Barat, Lampung. The repong damar system faces several pressing challenges that require further attention. These include:

- **Inconsistent government policies and extension support.** The Krui community has faced persistent challenges as a result of inconsistent government policies regarding the recognition of their rights in repong damar. The transition of some repong damar areas from KDTI to HTR has led to confusion and uncertainty, and the local communities struggle to sustainably manage and benefit from repong damar with limited support from the government. The Lampung Provincial Government's efforts to restrict the felling of damar trees have come into conflict with the central government's policy on HTR and oil palm allocation.
- **Decreasing land area.** In 1998, repong damar in Pesisir Barat covered an extensive area of approximately 29 000 ha, including areas beyond the state forest boundaries. However, in 2023, only 6 510 ha of repong damar remained.
- **Declining damar tree population**. The population of damar trees and biodiversity within the repong damar system have been steadily decreasing. While mature repong damar areas were once characterized by damar trees making up 65 percent of the tree community, a report from Hadiyan (2015) indicates damar trees now account for only 50.6 percent of the tree population. This decline poses a significant threat to the sustainability of damar cultivation and the biodiversity it supports.
- **Conversion to oil palm plantations.** The conversion of repong damar to oil palm plantations has been a longstanding concern, particularly in the Ngaras and Ngambur sub-districts. The economic appeal of oil palm cultivation, together with the promise

of quicker returns, has fuelled the shift away from traditional damar agroforestry. Despite concerns about the environmental impact and the loss of local lands to oil palm expansion, some community members perceive oil palm as a more secure economic option compared to damar.

2.10. Opportunities

The Krui community's repong damar management practice is legally recognized under the KDTI scheme. The government should support this traditional practice and avoid changing it to a different scheme that diminishes the community's efforts. Capacity-building programmes should enhance the Krui community's land management, sustainable practices and entrepreneurship, based on their interests and needs. These programmes should also explore collaborative governance models that can form a bridge between customary practices and formal regulations.

Another key opportunity lies in the standardization of prices at the farm level. A current challenge is that resin prices are determined by agents from Krui or Jakarta, and farmers are uncertain about the true market value of damar resin, both domestically and globally. There is a compelling need for government intervention to ensure fair pricing for farmers. The government's involvement in regulating the prices of damar resin purchased from farmers can not only benefit the farmer's livelihoods but also contribute to the preservation of damar forests, including those bordering the TNBBS area.

Developing a village enterprise to purchase damar resin from local producers at a standardized price will eliminate the risk of farmers having to sell to agents at lower prices. While this initiative has the potential to promote fairness and prosperity among damar farmers, it will require strong support from local governments to enact regulations governing damar resin price control. With thousands of hectares of damar trees in the region, optimal utilization of this resource could generate hundreds of billions of rupiahs in annual economic activity. Government intervention is crucial to uplifting the living standards of damar farmers, many of whom currently struggle to make ends meet.

Another way to improve the situation for damar resin farmers is to establish farmers' cooperatives to enhance market efficiency. This could empower farmers with greater bargaining power when dealing with resin traders. Encouraging farmers to expand their knowledge about damar and explore alternative product options could add substantial value to their products and enable them to access financial resources like People's Business Credit. This sort of empowerment would require continuous entrepreneurial capacity development and other support to farmers.

2.11. Partnerships

The success story of the recognition of repong damar as a KDTI in 1998 cannot be separated from the presence and roles of supporting research institutions such as the Programme for the Study and Development of Ecological Anthropology at the University of Indonesia, the Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), and advocacy NGOs such as the Indonesian Tropical Nature Institute (LATIN) and Friends for Nature and Environment (Watala). Currently, the community no longer has supporting partners to enhance their capacity or advocate for them. Organizations presently operating in the area are conservation-oriented, including the Wildlife Conservation Society and YABI Rhino Indonesia Foundation, as the repong damar area is in the buffer zone of TNBBS. These organizations focus on raising awareness within the community and among traditional leaders about the importance of conservation-based repong damar management.

2.12. Innovation, recognition and outreach

In recognition of the Krui community's traditional way of life that supports damar tree conservation, the government awarded the community the Kalpataru in 1997. The Kalpataru is an Indonesian environmental award given to individuals or communities for their outstanding contributions to environmental conservation and sustainable development. Despite this recognition, the government has provided limited extension services to support the community's conservation efforts.

3. KEY LESSONS LEARNED

Based on the case study's challenges and opportunities, the key lessons learned are as follows:

- Damar agroforestry in Lampung's Pesisir Barat Regency signifies a balance between tradition and evolving market demands. Traditional practices need to be adapted to align with changing economic landscapes while preserving ecological and social integrity. This requires strategies that integrate community norms with sustainability to navigate market shifts.
- Success depends on strong local institutions that emphasize community cohesion and effective governance. Empowering communities, fostering collaboration and promoting transparency are vital for managing resources sustainably.
- Recognition and security of land rights are critical, as they reinforce the community's ability to assert and maintain ownership claims. Clear land tenure policies acknowledging customary rights provide legal protection, thereby safeguarding cultural heritage and economic sustenance.
- Extension programmes play a key role in disseminating knowledge about damar tree management, biodiversity conservation and ecological benefits. These programmes empower local communities, fostering a proactive approach to environmental stewardship.
- Effective knowledge sharing is crucial, in particular, through farmers' field schools in villages, which are hubs for promoting collective learning and disseminating crucial insights.
- Law enforcement for maintaining damar agroforestry demands effective legal frameworks and prudent enforcement to prevent unauthorized activities. In this regard, a regulatory environment aligned with conservation goals and community interests is crucial.

4. FUTURE OUTLOOK

Repong damar, a traditional forest management practice that has endured for generations in Pesisir Barat, Lampung, continues to illustrate the resilience of local communities. Despite numerous challenges, this practice provides livelihoods and sustains cultural and environmental values. The repong damar management system provides local communities not only income, but also decision-making power. The HTR management system has introduced conflict as it replaces their previous decision-making process of the communities.

One of the persistent challenges facing communities engaged in repong damar is inconsistency in government policies. The recognition of repong damar under the KDTI scheme in 1998 was a significant milestone. But subsequent transitions to other schemes, such as HTR, have created confusion and uncertainty.

To secure the future of repong damar, it is important that stakeholders collaborate to empower and provide support to local communities. Capacity-building programmes must be initiated and tailored to their interests and needs. Such programmes could address agroforestry and diversified agricultural technical skills, entrepreneurial skills, and community institutional strengthening to improve governance structures and decision-making processes. These programmes should not be driven solely by political interests but should genuinely enhance the community's ability to manage their resources effectively.

Furthermore, a transition from existing KDTI and HTR schemes to recognition under customary forest rights could provide a more stable and supportive regulatory framework. However, such a transition poses its own set of challenges, requiring advocacy and collaboration with government agencies.

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REGIONAL SYNTHESIS

CENTRAL AFRICA

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BACKGROUND

The Central African region contains approximately 200 million ha of dense moist forest, 92 percent of it little disturbed, but with a growing trend of deforestation and degradation. Annual disturbance rates (deforestation and degradation) increased from 1.36 million ha per year in 2005–2015, to 1.79 million ha per year in 2015–2020 (Eba'a Atyi *et al.*, 2022). The annual rate of deforestation in Africa overall has decreased between 2016–2019 and 2020–2022 in all subregions and on the continent as a whole (FAO, 2024). The main drivers of deforestation are agricultural expansion, demographic growth and infrastructure development.

Under 30 million ha of the forest (15 percent) in Central Africa are classified as protected areas. Nearly 54 million ha (27 percent) were classified as production forests, mainly in the form of forestry concessions (Eba'a Atyi *et al.*, 2022). In recent years, the Democratic Republic of the Congo established an estimated 6 million ha of conservation concessions by converting existing production forest concessions or creating new ones. Besides the concessions, there are community forests and forests managed by local authorities.

Almost all countries in the region have ratified international conventions related to forestry, which has required the modification of certain institutional arrangements. In recent years, the sectoral ministries responsible for forests and the environment have set up departments whose task is to develop instruments to support sustainable development. With the support of international institutions, the institutional stakeholders in Central Africa have changed their forest management methods. Although most of the countries are described as fragile states, there is an undeniable effort to preserve the forests (The Fund for Peace, 2023; Karsenty and Ongolo, 2012).

The institutional weaknesses of the Central African states (Romijn *et al.*, 2012) and the lack of capacity and financial resources to implement the will of their governments, have resulted in the presence of international bilateral or multilateral partners that have been providing substantial technical support in the last decades. At the same time, the uptake of bilateral and multilateral funds for the protection of nature and the sustainable management of forests by the Congo Basin is still limited compared to other tropical regions (Eba'a Atyi *et al.*, 2019). Technical aspects of forest management have seen improvement over the years but there is still a lot of work to be done.

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OVERVIEW OF THE SELECTED CASES

Five case studies were selected for the revisit: two logging concessions (Lokoundjé-Nyong forest in Cameroon and Haut-Abanga in Gabon); two protected areas (Lossi Gorilla Sanctuary in the Republic of Congo and the Luba Caldera Scientific Reserve in Equatorial Guinea); and a forest plantation (Magara-Gashikanwa forest in Burundi) (see **Table 1**, Introduction for summary of the cases revisited). The forest management units range from large logging concessions (100 000 to 300 000 ha), and medium-sized protected areas (35 000 to 62 900 ha) managed in partnership by the state with others, to a small forest plantation of 60.8 ha managed by the state with the support of local communities. They are all natural forests except for the small forest plantation.

Haut-Abanga is the most successful case in terms of maintaining a high standard of forest management and deriving economic benefits while protecting the environment. Community participation and benefit-sharing is limited in almost all cases, which is a source of contention. The legislative framework has evolved positively in the region with the introduction of legislation aimed at promoting SFM. Shortcomings were particularly noted in relation to institutional and management frameworks in the forest management units; formal forest management planning, business management and financial viability; control of illegal activities and conflict management; protection of ecosystem services and biodiversity; and protection of social and cultural values, including traditional knowledge.

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TRENDS AND KEY CHANGES

A number of changes over the past two decades have had significant impacts on the efforts to maintain forest management objectives and high implementation standards.

REGULATORY CHANGES

Legal and institutional reforms were undertaken to support SFM in Cameroon and Gabon, strengthen protected areas and conservation in Equatorial Guinea, and facilitate the management of overlapping land uses (forestry, agricultural, mining and others) in the Republic of Congo.

Regulatory changes have been supporting Indigenous Peoples in the Republic of Congo (the Lossi case) and sharing of benefits with local people in Cameroon and Gabon (Lokoundjé-Nyong and Haut-Abanga). However, these reforms have not resulted in perceptible benefits for the local populations, except to a limited extent in the Haut-Abanga case.

DEGRADATION AND DEFORESTATION PRESSURES

The level of deforestation and forest degradation is relatively low in all cases, although it is on the rise in some. Lokoundjé-Nyong faces the most significant deforestation and degradation pressures from companies and local communities interested in converting the land to commercial agriculture, as well as from a population boom and incoming migrants fleeing wars. Some parcels of land have been granted to local communities and industrial companies, and more are in the proposal stage. There has also been degradation of forests and loss of flooded forests.

The open-access situation and lack of clear management structure have led to degeneration of the forest plantations in Magara-Gashikanwa and conversion of parts of it to agriculture. In Luba, there has been limited deforestation and degradation for agriculture near villages and roads.

Population pressure coupled with proximity to large cities has exacerbated pressures on forest resources. Commercial poaching for bushmeat in accessible areas of Luba is a major problem which threatens the endangered primate populations in the reserve. Poaching of wildlife due to insufficient eco-guard patrols is also an issue in Lossi. Gold panning is affecting the wildlife and their habitat in Haut-Abanga and Lossi.

DECLINE IN RIGHTS FOR LOCAL COMMUNITIES AND INCREASED CONTENTION

In four of the five cases, there were feelings of inadequate participation and benefits for local people from the forest management activities. In Lossi, the association of land-right holders had initiated the sanctuary, but the members felt that they could not participate effectively in decision-making and did not gain much income from the reserve activities. There were also crop damages caused by marauding wildlife, for which adequate compensation had not been provided.

In Lokoundjé-Nyong, local communities question the classification of the forest as a forest management unit without due consultation and feel it impinges on their villages, fields and plantations. They also feel excluded from the land sharing of the state with industrial agricultural companies and forestry concessions. Social benefits have not been provided by the companies operating in the area until recently, and the current forest managing company is the first to start providing some benefits.

Local communities of Luba state that access to the reserve is restricted and they do not benefit from the forest. They are not permitted to open new plots of farmland or conduct activities that could impact forest cover, but they are allowed to harvest non-timber forest products for household use. They do not benefit from the massive influx of tourists and researchers since they do not receive a share of the tourist fees and are not employed as guides, and the tourists are mostly day-trippers who do not stay for long in the area.

In Magara-Gashikanwa, the original local communities involved in plantation development were later excluded and lost their management rights and share of the products, while the Batwa community association now undertakes forest management tasks and is remunerated only through agricultural inputs and food for work. Members of the local communities and Batwa not included in the Batwa association are dissatisfied, as they wanted to be part of the initiative and benefit from it.

One exception is Haut-Abanga, where the Rougier Gabon company has been providing various social benefits since its FSC certification in 2008.

LACK OF FUNDING TO IMPLEMENT PLANS AND ACTIVITIES

Lack of sustained funding to effectively implement forest management plans and activities has become an issue in the three non-concession cases – Lossi, Magara-Gashikanwa and Luba. Once the initial funding streams through projects and donors were terminated, it became challenging to raise the required finances. This resulted in lack of sufficient resources for controlling access to the area, providing capacity building, reducing poaching and promoting ecotourism. Lack of permanent funding also hampers monitoring and control activities in Haut-Abanga.

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RESPONSES TO THE CHANGES

The key responses to the changes experienced are highlighted below.

ALTERED MANAGEMENT ARRANGEMENTS

The management structure has changed in three cases, with Lokoundjé-Nyong going through multiple changes of the management company. Both the legal status and management structure of the Magara-Gashikanwa forest plantation changed over time, starting with a tripartite partnership between the Gashikanwa commune, the forest services and the local communities organized in three group associations. The system collapsed in 2012, and in 2021 the tasks executed by the original group associations were transferred to an association of the neighbouring Batwa community in exchange for food and agricultural items. There is no forest management plan.

Management of the Lossi Gorilla Sanctuary shifted from a partnership between the Congolese State, the local population represented by the Association of Lossi Land Rights Holders and the European programme on African forest ecosystems (ECOFAC) to a new partnership between the Congolese State and the Odzala-Kokoua-Lossi Foundation in 2020; the Association of Lossi Land Rights Holders is still represented in the board of directors. Forest management plans were revised to develop ecotourism concessions and provide new sources of revenue to local populations, although these objectives have not yet been realized.

Haut-Abanga retains the same management status, with the same company managing the forests under a validated long-term management plan and a strengthened structure.

Luba is still being managed by INDEFOR-AP, a ministerial department, but with new partners and a new management structure and plan that is currently being validated to strengthen reserve management.

NEW OR EXTENDED PARTNERSHIPS

New partnerships have been forged to improve management and protection of the forest, raise capital, and add value and expand business. In Haut-Abanga, the Rougier Gabon company has been the exclusive partner of the StarPly processing plant since 2020, making it possible to exploit previous underutilized trees and greatly expanding the volume of logs processed.

In the Lossi case, a private tourism operator, the Congo Conservation Company, recently concluded an agreement with the Ministries of Forestry Economy and Tourism relating to the Odzala-Kokoua National Park and the Lossi sanctuary for the development of ecotourism concessions, although the infrastructure has not yet been developed.

In the Luba reserve, a host of stakeholders have signed partnerships with INDEFOR-AP in various fields, including research, monitoring and protection of endangered species, communication, and cultural and tourism aspects. The State of Equatorial Guinea also provides funding, technical expertise and other support.

CHANGING FOREST MANAGEMENT PRACTICES AND CAPACITIES

Forest management practices have been improved in Haut-Abanga over the last ten years, with forest operations being implemented in strict compliance with established standards, and with continual raising of staff awareness on occupational safety standards. The company quickly committed to FSC certification to access the international market and has remained certified to date. This achievement is attributable to the commitment to traceability and responsible timber harvesting.

In the Magara-Gashikanwa forest plantations, forest management activities, including nursery operations, pruning, harvesting, fire control and application for cutting permits, were scheduled and implemented based on the forest management plan until 2012. Since the cancellation of the initial tripartite partnership, the communal administration harvests poles when needed for public construction, and without a forest management plan. The original association members who were trained in forestry techniques such as nursery establishment and pruning are no longer involved in plantation management.

Within INDEFOR-AP, the conservation department managing the Luba reserve lacks human resources, technical capacity, tools and equipment for effective management of the reserve. Other organizations were supporting conservation and monitoring activities. A new management plan with provisions for surveillance, patrol and coordination services has been developed, supported with an updated organizational structure, to ensure sustainable management of forest resources and to combat poaching inside the reserve.

At Lossi, since the end of the ECOFAC programme in 2008, forest management activities have been limited. The new management plan seeks to improve practices and raise funds for conservation and local livelihoods.

In the case of the Lokoundjé-Nyong forest, SFM practices have not been prioritized by the various companies that managed it since its creation to the present.

PRODUCT DIVERSIFICATION AND VALUE ADDITION

The Rougier Gabon company in Haut-Abanga had succeeded in implementing a commercial strategy based on the promotion of lesser-known timber species, enabling it to exploit many underutilized species. The log export ban in 2010 supported value addition and resulted in larger sales volumes through partnership with a local processing company that could use trees of low wood quality and underutilized species found in second-rotation zones.

In Lokoundjé-Nyong, the range of species harvested has been expanded to generate increased value. However, this practice can potentially lead to further degradation (high grading) of the forest with species of high to lower value being depleted in succession.

SOCIAL MEASURES UNDERTAKEN

The Rougier Gabon company began to address social issues in Haut-Abanga in 2008 in an effort to achieve FSC certification and a 2014 ministerial decree that provided regulatory guidance on sharing of profits from forest exploitation. The company supported the village of Elarmilo, eligible to receive the benefits of a mined plot in Haut-Abanga, to enhance its residents’ livelihoods through a piggery. The company also provided ad hoc support to the inhabitants of Biboulou village. Support for housing and children’s education is part of the benefit package for its employees.

The private company managing the Lokoundjé-Nyong forest recruits its workers locally and provides them with protective work equipment, insurance and support for housing and food. The company has contributed to repairing bridges, schools and meeting sheds, among other infrastructures, in neighbouring villages. It is the first forest company operating in the Lokoundjé-Nyong forest to carry out social projects and has recently signed a contract with the Forest Peasants Committees to provide nursery equipment and technical assistance.

At Luba, the new management plan includes various development activities that are expected to contribute to increased household income from trade, tourism and agriculture.

At Lossi, there has been little done to date in terms of enhancing community participation and benefits from sanctuary management. Some compensation measures and insurance have been put in place for crop damage by wildlife, but the terms are not viewed as being fair and adequate. The new partner, the Congo Conservation Company, has committed to investing 5 percent of its turnover from ecotourism in a fund intended for the development needs of local populations, but this has not yet been implemented.

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ENABLING CONDITIONS

Experiences and insights gained from the evolving contexts and challenges of these cases point to the following enabling conditions or success factors that could contribute to SFM:

- technical and financial support for SFM, conservation, research, capacity building, and local community development from various partners (Magara-Gashikanwa, Luba, Lossi);
- synergies among scientific research, nature conservation, production and tourism, with long-term research and monitoring providing critical data for management plan development (Lossi, Luba, Haut-Abanga);
- a well-functioning managing entity with technical capacity for management and business development (Haut-Abanga);
- continuous adherence to the forest management plan and commitment to SFM demonstrated through forest certification (Haut-Abanga);
- partnership with a downstream processing industry to generate value from lower-quality wood found in second-rotation zones and to limit pressure on high-value species (Haut-Abanga);
- commercializing and harvesting underutilized tree species to expand operations (Haut-Abanga, Lokoundjé-Nyong);
- strong interest in conservation by local communities (Lossi);
- an integrated approach to conservation that will contribute to sustainable development goals and open up additional financing opportunities (Lossi);
- updated management plans and appropriate organizational structures for the protected areas (Lossi, Luba);
- enhanced control of poaching through funding, training, community involvement and incentives;
- strong links between conservation, SFM and tourism, and exploring and capturing ecotourism possibilities (Lossi, Luba, Lokoundjé-Nyong and Haut-Abanga);
- sustainable livelihood options and alternatives to bushmeat consumption;
- community organization, capacity building, management planning and implementation, and clear benefit-sharing arrangements to generate economic benefits for the government agencies and communities in a profitable forest plantation venture (Magara-Gashikanwa); and
- multistakeholder participation and strategies to frame and implement realistic policies and protection measures for the forest areas, considering the diverse interests, pressures and opportunities (Lokoundjé-Nyong, Luba, Lossi and Magara-Gashikanwa).

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FUTURE OUTLOOK

The revisited cases provide the following insights into the future of SFM in the region, which is far from reassuring. However, the cases of Haut-Abanga and the Luba Caldera Scientific Reserve in particular offer hope in view of the difficulties overcome and the major milestones already achieved.

Local communities living in and around forest areas have limited economic opportunities, and their dependence on forest resources and the land is high. Lack of effective community participation, capacity building and benefit-sharing are serious impediments for SFM in Central Africa, as shown by four of the five case studies reviewed. In Lokoundjé-Nyong, the concession company has no plans to enhance local employment or livelihoods, and local communities have no stake in or benefit from SFM, with resultant high and ongoing risks of deforestation and land conversion. Little attention had been paid to local community needs in Lossi and Luba in the past, and Luba, in particular, faces heavy and ongoing poaching. However, upcoming new management plans aim to enhance community participation and increase the socioeconomic benefits that local communities can derive. Various opportunities exist to enhance local livelihoods through employment in forest protection, management and ecotourism, and through improved agricultural practices. In Magara-Gashikanwa, there are no plans to shift to a more consistent participatory approach that includes all local communities, and the plantation forests are likely to face further degradation and decline under the existing open-access use.

New partnerships and funds are forthcoming for the protected areas studied – Lossi and Luba. The potential to simultaneously meet conservation and sustainable development goals is of interest to donors and partners, along with scientific research possibilities. New management plans and institutional structures have been developed which, if well-funded and implemented with adequate community participation and benefits, could have successful conservation and development outcomes. The plans include optimally using the high ecotourism value of these areas.

The future of production forests in Central Africa further depends on the strength and consistency of the institutional structures and application of sound forest management practices. The outlook for SFM is stronger in concessions such as Haut-Abanga in Gabon, with its strengthened organization, rigorous management planning, and adherence to practices meeting FSC certification standards; additionally, the concession has embraced product diversification and value addition strategies, including the harvesting and processing of lower-quality and underutilized tree species, the implementation of payment for ecosystem services scheme, and the use of biodiversity credits. Future prospects for SFM seem dire in the forest concession of Lokoundjé-Nyong and the Magara-Gashikanwa forest plantation owing to management changes, limited planning, inconsistent policies, changing demographics and conversion pressures.

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CENTRAL AFRICA

HAUT-ABANGA: PRIVATE–PUBLIC PARTNERSHIPS AS A KEY TO SUSTAINABLE FOREST MANAGEMENT

Dimitri Essono Milla, University of Le Mans and Omar Bongo University

NAME OF FOREST	**Haut-Abanga Forest Concession under Sustainable Management**
LOCATION	**Northwest Gabon, on the edge of the Monts de Cristal chain, Estuaire province and Woleu-Ntem province**
AREA (ha)	**293 833**
MANAGING ENTITY	**Rougier Gabon Company**
MANAGEMENT OBJECTIVES	**Sustainable timber production; collective social development; protection of biodiversity and ecologically sensitive sites**
FOREST TYPE	**Natural evergreen rainforest at low and medium altitudes**

1. INTRODUCTION

Gabon has 23.5 million ha of natural forest covering 91 percent of the land area and had a low deforestation rate of 0.05 percent between 2010 and 2020 (FAO, 2020). Starting with its forest policy from 1996, the country has been trying to increase and optimize the forestry sector's contribution to economic and social development, with forestry being a top employer (Gabonese Republic, 2021). Under its Forest Code (Law No. 16/2001), Gabon set out a contractual framework for businesses to undertake sustainable management of forest concessions under 30-year forest management plans.

The Haut-Abanga forests were logged relatively intensively for three decades, between 1960 and 1990. The main loggers were the Gabon Forestry Company (Compagnie Forestière du Gabon), African Forestry Exploitation Company and Leroy Gabon. When their exploitation period came to an end, their permits were grouped together, as were those previously allocated to third-party operators, and then transferred to the operator Rougier Gabon. The new operator of the Haut-Abanga forests began operations in the Babylone and Mikongo areas in 1994. Rougier Gabon initially concentrated development in these areas until the implementation of the forest management plan in 2001. This plan was initiated at a time when sustainable forestry practices were becoming a national priority. The central issue was the concessionaires' ability to ensure the sustainable production of timber to be harvested, and many institutions, including FAO, launched programmes to promote sustainable management of Central Africa's forest ecosystems. Rougier Gabon seized this excellent opportunity.

Initially, this operator signed a provisional development–exploitation–transformation agreement with the Gabonese government on 20 July 1998. On 25 January 2002, in accordance with the new Law No. 16/2001, Rougier Gabon received final approval to operate under the Forest Concession under Sustainable Management (Concession Forestière sous Aménagement Durable, CFAD) legal form issued by the General Directorate of forests. During this period, a number of projects were carried out to implement the CFAD management plan, including a forest inventory, ecological studies and a socioeconomic survey. According to Forêt Ressources Management and Groupe Rougier (2001), the CFAD had an area of 288 626 ha comprising 102 744 ha of primary forest, 73 559 ha of degraded secondary forest, 66 610 ha of degraded primary forest, 39 211 ha of secondary forest, 5 907 ha of swamp forest, 298 ha of water, 248 ha of rock outcrops and 50 ha of crops. The surface area is currently estimated at 299 833 ha, with the additional 5 207 ha mainly made up of primary and secondary forest. This increase in the surface area is due to the decision taken by the General Forestry Department in 2013 to compensate Rougier Gabon based on Forest Management Permit Order No. 45/13 (Groupe Rougier, 2023).

The Haut-Abanga site is a permanent state forest area straddling two provinces (75 percent in Woleu-Ntem and 25 percent in Estuaire). Over the years, Rougier Gabon has expanded its business amid the many political, socioeconomic and environmental changes that have taken place. A review of the literature and interviews with stakeholders (e.g. NGOs, scientists, administrators, local communities) were conducted, as well as direct observation of the forest concession, to identify and analyse the management process and changes over the past 20 years.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The main objectives defined in the initial management plan (2001) remain valid today as follows:

- ensure sustainable forest exploitation and production of timber;
- carry out research to improve the conditions applicable to the exploitation and management of forests;
- understand the forest resource over the medium term taking into account all species;
- understand the forest resource over the long term, accounting for future commercial trees with a diameter of at least 10 cm;
- assess biological diversity and identify ecologically sensitive areas;
- visualize the distribution of different forest resources;
- preserve the ecosystem and biodiversity; and
- promote the social development of employees and respect for local communities.

2.2. Type and condition of forest and scale of operation

Dense evergreen rainforest at low and medium altitudes comprises the forest of Haut-Abanga CFAD. The main commercial tree species found in the concession include aielé (*Canarium schweinfurthii*), andoung (*Tetraberlinia polyphylla*), azobé (*Lophira alata*), dabema (*Piptadeniastrum africanum*), ghéombi (*Sindoropsis letestui*), ilomba (*Pycnanthus angolensis*), okan (*Cylicodiscus gabunensis*), okoumé (*Aucoumea klaineana*), omvong (*Dialium pachyphyllum*) and padouk (*Pterocarpus soyauxii*).

Global Forest Watch data indicate that forest cover has been well preserved in the concession, with very little tree loss detected during the past 20 years (615 ha of tree cover loss between 2001 and 2023 corresponding to 0.22 percent of the concession area).

2.3. Legal status and management structure

The Haut-Abanga forest concession has retained the same legal status. The same company, Rougier Gabon, continues to manage the forest area under an authorization issued in 2002 with the final validation of the management plan. In view of the logistical and economic constraints involved in exploiting the vast forest area and the large number of species, the Forestry Department decided to divide the CFAD into two forest planning units (UFAs): UFA 1 has four forest management units (FMUs), while UFA 2 has five FMUs. This enables the public administration to progressively control the activities of the forest operator.

Between 2006 and 2015, the creation of new in-house skills was generalized, in order to guarantee much better forest management of the CFAD. The local management comprises the following staff:

- site manager;
- health, safety and environment manager;
- social manager;
- head of wildlife by territory;
- site personnel manager;
- post-exploitation controllers; and
- felling team leader.

The structural change is also perceptible with the creation of the Environmental and Social Responsibility and Certification Department to meticulously monitor the implementation of development plans. This department comprises the following staff:

- forest engineer, specialized in forest management, management and certification;
- forest engineer, in charge of control, follow-up and monitoring;
- head of internal and external social programmes; and
- cartography and geomatics expert.

2.4. Regulatory environment and government support

The management of Haut-Abanga forest followed the general framework for logging stipulated in Law No. 16/2001, including the requirement for forest inventory, conservation measures, wildlife management and exploitable diameters of trees. To this law was added Decree No. 689-PR-MEFEPEPN in 2004, specifying technical standards for the development and sustainable management of forests. This reinforcement continued with Decree Nos. 117/PR/MEFEPEPN and 119/PR/MEFEPEPN, which specified tree species and respective diameters that could be exploited. Subsequently, Decree No. 0137 of 2009 banned the harvesting of certain species, notably afo (*Poga oleosa*), andok (*Irvingia gabonensis*), douka (*Tieghemella Africana*), ozigo (*Dacryodes buettneri*) and moabi (*Baillonella toxisperma*). Decree No. 350/PR/MPERNFM of 2016 set the conditions for the exploitation of kevazingo or bubinga (*Guibourtia tessmannii*) and ozigo, and Order No. 33/MFEPRN/CAB established a Special Authorization for the export of processed products.

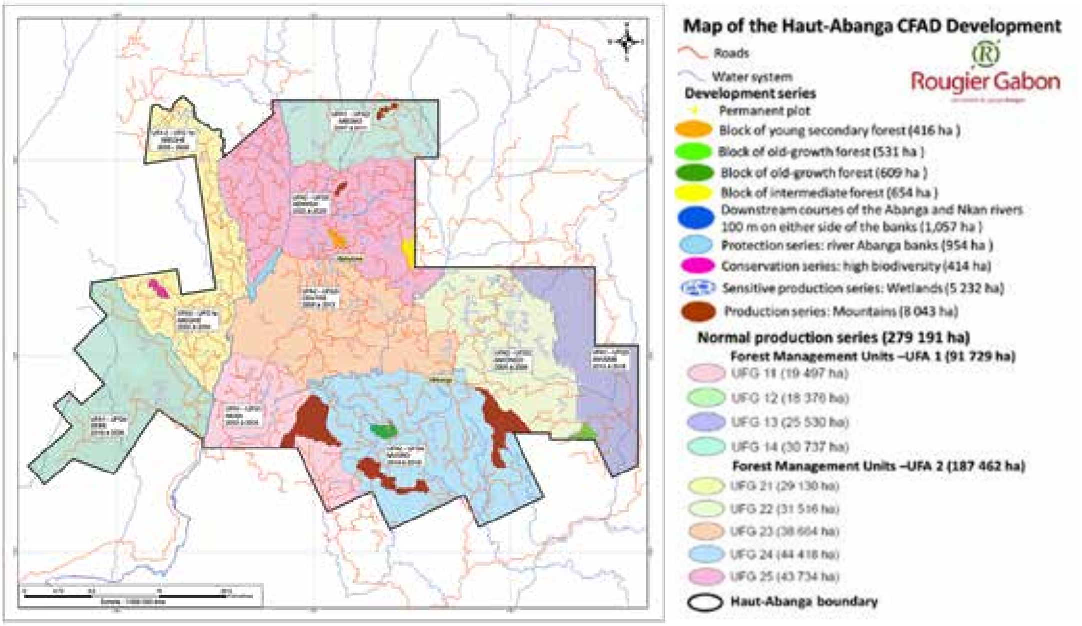
While there are around 60 tree species in the Haut-Abanga concession that have been inventoried and can be marketed by regulation, there are only a handful of species with high value, such as okoumé and kevazingo. The operator had succeeded in promoting underutilized species that were little known on the market, which enabled it to exploit around 40 species. However, since 2010, legal constraints resulting from various regulatory reforms in the forestry sector, combined with changes in the market, have meant that the operator can now only supply customers with around 20 species.

2.5. Forest management practices

Forest resource management planning has proceeded strictly according to the timetable set out in the management plan. This adherence to the management plan is attributable to the commitment to traceability and responsible timber harvesting. In 2004, the company obtained its first ISO 14001 environmental management certification. Four years later (2008), the CFAD of Haut-Abanga achieved FSC certification; the concession remains FSC-certified to this day.

With regard to the harvesting rotation, operations take place in one or two FMUs in any given year, with operations in each FMU lasting two to eight years depending on various factors. The nine FMUs range in size from 18 376 ha to 44 418 ha. Each FMU has a management plan valid for five years, and annual cutting areas are open to harvesting for three years. The first harvesting operation commenced in 2003 (Forêt Ressources Management

Figure 1. *Haut-Abanga CFAD development plan*


Map of the Haut-Abanga CFAD Development
Roads
Water system
Rougier Gabon
Development series
Permanent plot
Block of young secondary forest (416 ha)
Block of old-growth forest (531 ha)
Block of old-growth forest (609 ha)
Block of intermediate forest (654 ha)
Downstream courses of the Abanga and Nkan rivers 100 m on either side of the banks (1,057 ha)
Protection series: river Abanga banks (954 ha)
Conservation series: high biodiversity (414 ha)
Sensitive production series: Wetlands (5 232 ha)
Production series: Mountains (8 043 ha)
Normal production series (279 191 ha)
Forest Management Units –UFA 1 (91 729 ha)
UFG 11 (19 497 ha)
UFG 12 (18 376 ha)
UFG 13 (25 530 ha)
UFG 14 (30 737 ha)
Forest Management Units –UFA 2 (187 462 ha)
UFG 21 (29 130 ha)
UFG 22 (31 516 ha)
UFG 23 (38 664 ha)
UFG 24 (44 418 ha)
UFG 25 (43 734 ha)
Haut-Abanga boundary

Source: Mikongo Planning Department. n.d. Internal document
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

and Groupe Rougier, 2003); harvesting in the last FMU is scheduled to finish in 2026, completing the first harvesting rotation for the concession.

An inventory of the forest resource is carried out in a new FMU while harvest is ongoing in another FMU. This enables a forecast map to be drawn up to help plan the next harvesting area. Resource availability and environmental constraints influence the type of road to be created: dry season road (moderate maintenance needed, stable without sunlight) or wet season road (increased maintenance required, benefits from sunlight for drying).

Rougier Gabon attempts to implement its operations in strict compliance with established standards. The Forestry Department carries out a survey to establish the limits of the cutting area and then issues the timber-harvesting authorization. Once the timber has been harvested, the Forestry Department is required to issue a closure report, followed by minutes of closing.

Harvesting volume is determined based on the minimum exploitable diameter, which varies according to the timber species and is generally greater than 60 cm. For example, sorro (*Scyphocephalium ochocoa*) has a minimum harvestable diameter of 60 cm, and okoumé has a minimum diameter of 70 cm, while azobé has a minimum diameter of 80 cm. Beli (*Paraberlinia bifoliata*) and sipo (*Entandrophragma utile*) require diameters of 100 cm and 110 cm, respectively.

After harvesting, no enrichment planting activities were carried out, but the logging gaps were monitored to assess the natural regeneration of harvested species.

To derive a higher volume per hectare, Rougier Gabon has been harvesting trees near watercourses less than 5 metres wide since 2015, as permitted by law. A consulting firm carried out an environmental assessment of these areas in 2016, which recommended certain measures to reduce forest degradation. Following these recommendations, the exploitation of trees near watercourses was formalized, subject to distinct tracking and strict directional felling. The aim of this differentiation is to eventually assess the volume and profitability of harvesting timber from these areas.

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Controlled felling with inventory and traceability

In addition, tree-harvesting activities are monitored on a weekly basis. A monthly statistical report is drawn up specifying the harvesting outcomes of trees in an area, including the number of trees planned to be harvested, number of well-felled trees (success), and the number of badly felled trees (failure). "In the event of failure, e.g. the felled tree touches the river, a decluttering team is dispatched to the site. We need to avoid disrupting water flow and the mobility of fish stocks", said Hiss Boula, Development Manager, Rougier Gabon North Zone.

Management practices have been improved over the last ten years, particularly in terms of continually raising staff awareness of forest safety standards, especially among new recruits in the felling sector.

Rougier Gabon's management has also adopted a new approach to rewards. The production bonus initially awarded to employees ignored the quality aspect of the end products, focusing instead on the volume of work carried out. In 2011, Rougier Gabon introduced a policy of awarding bonuses, or penalties, for monitoring and quality control along the entire wood-harvesting chain (e.g. felling, skidding, primary wood processing and volume estimation).

Boundary between two forest management units (former cutting zone on left; future cutting zone on right)

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2.6. Production and business aspects

The 2010 decision to ban log exports from Gabon in order to encourage the development of a local market through a first level of processing brought about real changes. The company began to benefit from this in 2015 with an increase in production volume (United Nations Economic Commission for Africa, 2015).

Okoumé remains the main species marketed by Rougier Gabon. The company was quick to commit to FSC certification, which provides preferential market access in Europe, Asia, sub-Saharan Africa, North America, North Africa and the Middle East (Groupe Rougier, 2021). Logs are processed locally in the Nkok zone through the Gabon Special Economic Zone,[1] a private–public partnership.

Since 2020, Rougier Gabon has been the exclusive partner of the StarPly processing plant at Nkok. This partnership has made it possible to exploit low-quality trees (e.g. in terms of straightness). In 2021, the volume transported to Nkok in the first quarter was 149 891 m^3; in 2022, it rose to 212 286 m^3 for the same period.[2]

2.7. Social aspects and impacts

Law No. 16/2001 (Article 251) allowed Rougier to pursue a liberal social policy. The company shared the benefits of its production with all villages located within 10 kilometres of the concession (even if the inhabitants had no activities within the concession). This policy was not applicable in the Haut-Abanga CFAD because of its extreme remoteness from the villages. Nonetheless, Rougier Gabon has often shared the profits from this concession with local communities.

Rougier Gabon pays attention to the grievances of local residents, even those living far from the CFAD, as evidenced in the case of the inhabitants of Biboulou village, who have benefited from the donation of okoumé wood to renovate their houses. The company often intervenes on an ad hoc basis, providing support for health care, funerals and ceremonies.

The achievement of FSC certification in 2008 provided the impetus for strengthening social

Extension and development of workers' housing in Mikongo

TRIONS NOS DECHETS
PLASTIQUES
METAUX
ORGANIQUES

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[1] For more information please visit https://gsez.com/en/

[2] Difficulty in accessing wood production data limits the possibility of comparing log volumes over a longer period.

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Pigsty in the village of Elarmilo

management, which was consolidated with Decree No. 105/MEFPRN/SG/DGF/DDF/SACF of 2014 and the recruitment of three staff to work on social issues.

The village of Elarmilo, with a population of 19, was eligible to receive benefits from a mined plot in Haut-Abanga under the 2014 decree. Following a social survey, participatory mapping and feasibility studies, Elarmilo villagers created a piggery with the support of Rougier Gabon. This initiative also enabled local people to participate in the management of a portion of the forest concession and share in the benefits (Angone, 2016).

Rougier Gabon also supports the education of the children of its employees and local communities, covering school supplies, building a preschool and a classroom, and providing salaries of teachers. In addition, Rougier is renewing and extending the Mikongo base, building housing for managers and supervisors, and providing continuous electricity to the site.

Innovation is also evident in the operation of its Health, Safety and Environment Department, whose staff provide in-house training in first aid, for example.

2.8. Envirnmental values and impacts

The company has developed systems and implemented measures to consolidate its efforts in safeguarding the environment (Obiang *et al.*, 2011). For example:

- The company has demonstrated and maintains its commitment to the conservation and protection of ecologically sensitive areas. At the start of operations, 5 percent (14 642 ha) of the CFAD area was protected (Bayol *et al.*, 2004). This has now increased to more than 32 981 ha, representing 11 percent of the CFAD.
- Prior to 2008, the company created timber yards within the cutting areas. However, this strategy was sometimes unsuitable when low volumes of species were available for extraction and because it caused unnecessary forest clearing. Timber yards are now set up outside the cutting areas along the roadside.
- The company has implemented measures to reduce erosion from forest roads and monitors the soil excavation sites (pre- and post-use).

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A large log yard located 15 kilometres from the village of Biboulou

- High conservation value areas within the concession have been delineated. These include a 30-metre buffer zone around permanent swamps and watercourses over 5 metres wide. When a salt-lick was discovered in 2016, the company designated it a protected site.
- To control and manage the impact of hunting on wildlife, two estates for subsistence hunting were created in Haut-Abanga. Hunting of protected species is strictly prohibited, and animals killed in the estate can only be used for family consumption. Failure to comply with these directives will result in the immediate loss of hunting rights. Hunting is authorized only for employees with a permit and a rifle, and the company registers such employees with the central administration. For fishing activities, an application must first be made to the Wildlife by Territory manager.
- Rougier Gabon recycles or disposes properly of the waste it produces. Old car tyres are used for road markings and decoration. All the scrap metals are sent to Nkok, and ferrous materials are sold to operators specializing in iron recovery.
- Since 2016, environmental monitoring has been carried out by an internal audit body to ensure sustainable management of all areas affected by forest operations.

2.9. Challenges and threats

One of the challenges facing the Haut-Abanga CFAD in terms of sustainable forest management is overlap with gold-mining activities. Gold panning using excavators is threatening wildlife and sensitive ecosystems (such as watercourses and swamps), which Rougier Gabon aims to preserve.

In addition, there is inadequate monitoring of the condition of roads and bridges after logging. Abandoned roads can continue to be a significant source of erosion, and there needs to be proper closure and decommissioning of forest roads after harvesting to control erosion and reduce accidents.

2.10. Opportunities

Demand for raw materials to produce medium-density fibreboard has enabled the operator to increase production volume by making use of underutilized species that are abundant in the second rotation areas. This collaboration with the Gabon Special Economic Zone has compensated for the reduced number of harvestable species resulting from legislative restrictions. Rougier Gabon also aims to promote new species in the market to reduce pressure on species that are currently highly value.

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Digitized information collection in the forest

2.11. Partnerships

Rougier Gabon has been able to develop knowledge on environmental and wildlife management through national and international partnerships.

One such example is the REGEFOR[3] project led by the French National Research Institute for Sustainable Development[4] involving several institutional partners (2018–2020). This research project focused on understanding post-harvesting dynamics in logged forest stands and on skidding trails. Similarly, under the P3FAC[5] project launched in 2017, Rougier Group partnered with the Nature+ Association, Gembloux Agro-Bio Tech – University of Liège, and the French Agricultural Research Centre for International Development (CIRAD) to better understand the dynamics and phenology of tree species in its concessions.

Rougier Gabon collaborates with the World Wildlife Fund (WWF) and signed an agreement with the Woleu-Ntem Provincial Directorate of Water and Forests for awareness-raising, surveillance, wildlife management and the fight against poaching in Haut-Abanga (Group Rougier, 2023).

2.12. Innovation, recognition and outreach

The company is interested in scientific research that provides new knowledge to improve the sustainability of forest management, as noted above. In 2010, it signed a framework agreement with the National Scientific and Technological Research Centre (Centre National de la Recherche Scientifique et Technologique). The company has trainees onsite from the National School of Water and Forests (Ecole Nationale des Eaux et Forêts) and the University of Technical Sciences of Masuku (Université des Sciences Techniques de Masuku).

Rougier Gabon has made significant efforts to digitalize information and procedures as well as to develop specific applications to support forest management. The company has gradually migrated forest data to the cloud, facilitating improved data access. In 2018, the company started installing tags on inventoried trees and processing data through an open-source business management software. Since 2021, mobile input of operational data has been developed for all sites.

3. KEY LESSONS LEARNED

Rougier Gabon's strong commitment to sustainable forest management, including social, environmental and economic sustainability, has enabled its operations to thrive, with more than 600 employees in Haut-Abanga.

The company made an early decision to obtain FSC certification to overcome the weakness of local institutions and ensure the traceability and reliability of its products. The certification also helps to ensure the implementation of appropriate measures to protect the environment.

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[3] Post-exploitation regeneration of commercial species in forest concessions under sustainable management in Gabon *(Régénération post-exploitation des essences commerciales du Gabon)*

[4] For more information please visit https://en.ird.fr/

[5] Public–private partnership to sustainably manage the Central African forests

Although Rougier Gabon works closely with research institutions, the lack of permanent funding is an obstacle to continued monitoring of the research plots. The country's forestry sector is evolving, and similar studies need to be extended to other forest operators, many of whom are not yet certified.

4. FUTURE OUTLOOK

Rougier Gabon is looking to expand its expertise in the valuation of ecosystem services, including monitoring and quantifying wildlife value for biodiversity credits. The company's management intends to develop new conservation tools as part of its participation in the national strategy to promote biodiversity.

The policy of safeguarding high conservation value areas and combating poaching provides an opportunity to develop ecotourism, given the diversity of flora and fauna present in the concession (e.g. panther, elephant, bushpig, duiker, gorilla).

In terms of scientific research, more work is needed to identify tree species that struggle to regenerate naturally (e.g. kevazingo) and may therefore require restoration planting. To strengthen resilience in the face of climate change, phenological studies could be set up to assess changes in flora and, by extension, in fauna. Monitoring of changes in biomass would also be beneficial.

Local communities need further support from NGOs and associations to carry out projects financed by the Local Development Fund. For example, Rougier management is concerned about the long-term future of the pig farm, as the local population has partially taken control of it after delays in the disbursement of project funds.

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CENTRAL AFRICA

LACK OF COMMUNITY PARTICIPATION AND BENEFITS THREATENS THE FUTURE OF LOKOUNDJÉ-NYONG FOREST IN CAMEROON

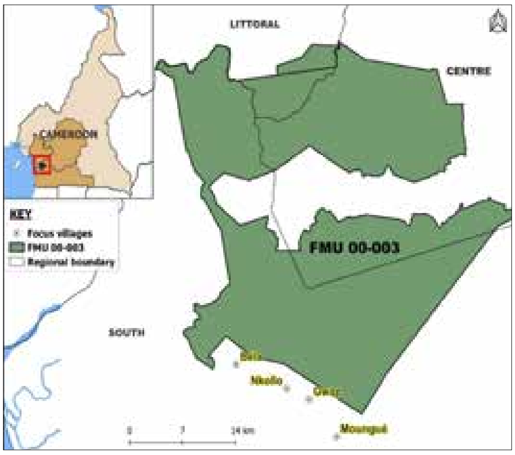
Richard Sufo Kankeu, CIFOR-ICRAF

NAME OF FOREST	**Lokoundjé-Nyong forest**
LOCATION	**Sud, Littoral and Centre Provinces, Cameroon**
AREA (ha)	**102 699**
MANAGING ENTITY	**Propalm Bois SARL**
MANAGEMENT OBJECTIVES	**Timber production**
FOREST TYPE	**Natural tropical coastal evergreen forest (low to medium altitude)**

1. INTRODUCTION

The identification of the Lokoundjé-Nyong forest was carried out in 1997 as part of a pilot and development experiment for industrial logging implemented under the Government of Cameroon's strategy to make sustainable use of its natural resources. This mapping exercise, titled "Zoning Plan of Southern Cameroon", was financed by Canadian cooperation and aimed to develop a process for identifying forests for sustainable management in the permanent forest domain in Cameroon (Leprohon, 2000).

Figure 1. *Location map of the Lokoundjé-Nyong forest management unit*



Source: InfoCongo. n.d. *InfoCongo*. [Cited 18 December 2024]. https://infocongo.org/

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

The forest area acquired the status of a forest management unit (FMU) following the implementation of the zoning plan. The Lokoundjé-Nyong forest reserve was classified as a production forest in the private forest domain of the state according to Decree No. 97/073/PM of 5 February 1997 (ECARE SARL, 2021).

The sustainable forest management practices of the Lokoundjé-Nyong forest were evaluated as an FAO *In Search of Excellence* case study in 2002 (Georges, 2003). This current report considers the changes and developments in the area over the past 20 years.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

Since the year 2000, when the forest area of 125 568 ha was allocated to Mba Mba Grégoire (MMG) SARL, the primary management objective has been to produce timber for export. In 2012, the forest was partially declassified, and 21 552 ha were allocated to the industrial company Biopalm for the extension of its banana, oil palm and rubber plantations by Decree No. 2012/3509/PM. However, this did not lead to a change in the management objectives of the forest.

2.2. Type and condition of forest and scale of operation

Forests in the area are dominated by *Caesalpinioideae*, *Sacoglottis gabonensis* (bitterbark tree) and *Lophira alata* (red ironwood) (Gonmadje *et al.*, 2003; Wijma Cameroon SA and Nature+ ASBL, 2016).

After the decommissioning and granting of 21 552 ha in 2012 to Biopalm, the remaining administrative area was 104 016 ha. This was further reduced to 102 699 ha following the delineation of the FMU and the completion of the forest inventory in 2016 by the Compagnie Forestière of Kribi and in 2021 by Propalm Bois SARL. **Table 1** illustrates the change in forest typology observed in the Lokoundjé-Nyong forest between 2004 and 2021. The forest inventory in 2004 indicated a surface area of 129 188 ha compared to the 125 568 ha contained in the 1997 classification decree; it is unclear how this has been taken into account in the inventory data for 2004 and 2021.

Comparison of the data from 2004 to 2021 suggests that 67 percent of flooded forests have disappeared, while young secondary forests have come to account for 12 percent of the forest area. The disappearance of the flooded forests is likely due to the expansion of agricultural operations by local communities living inside the Lokoundjé-Nyong forest. There is also significant illegal exploitation (Independent Observer for the Control and Monitoring of Forest Offenses, 2007) due to population growth and the migration of communities fleeing the war in the northwest, southwest and north of Cameroon.

The abundance of light-demanding species and secondary forest species in the Lokoundjé-Nyong forest testifies to the degradation of the forest from high-intensity logging. Furthermore, strong anthropogenic pressures, including conversion to agriculture, hunting and illegal logging, are observed in the western part of the FMU (La Forestière Prospecting Company, 2004). There is also a large oil palm grove with a base camp and school inside the FMU, extending over 1 000 ha to the west of the FMU (ECARE SARL, 2021). All of this human presence and activity around and inside the FMU contributes significantly to deforestation and forest degradation. An analysis performed on the Global Forest Watch[1] mapping platform indicates that the Lokoundjé-Nyong forest lost 10 800 ha of

Table 1. *Forest typology in 2004 and 2021 in the Lokoundjé-Nyong forest*

FOREST TYPE	2004	2021
Humid evergreen forest (dense)	55 550 ha (43%)	54 430 ha (53%)
Humid evergreen forest (secondary)	51 675 ha (40%)	26 702 ha (26%)
Humid evergreen forest (young secondary)	-	12 324 ha (12%)
Flooded forest	20 670 ha (16%)	6 778 ha (6.6%)
Non-forest (agricultural plots, infrastructure, etc.)	1 293 ha (1%)	2 465 ha (2.4%)
Total area	**129 188 ha**	**102 699 ha**

Source: La Forestière Prospecting Company. 2004. Management plan of 00 003 Forest Management Unit (FMU). MMG SARL. Ministry of Environment and Forests. Cameroon; ECARE SARL. 2021. Management plan of 00 003 forest management unit. Propalm Bois SARL.

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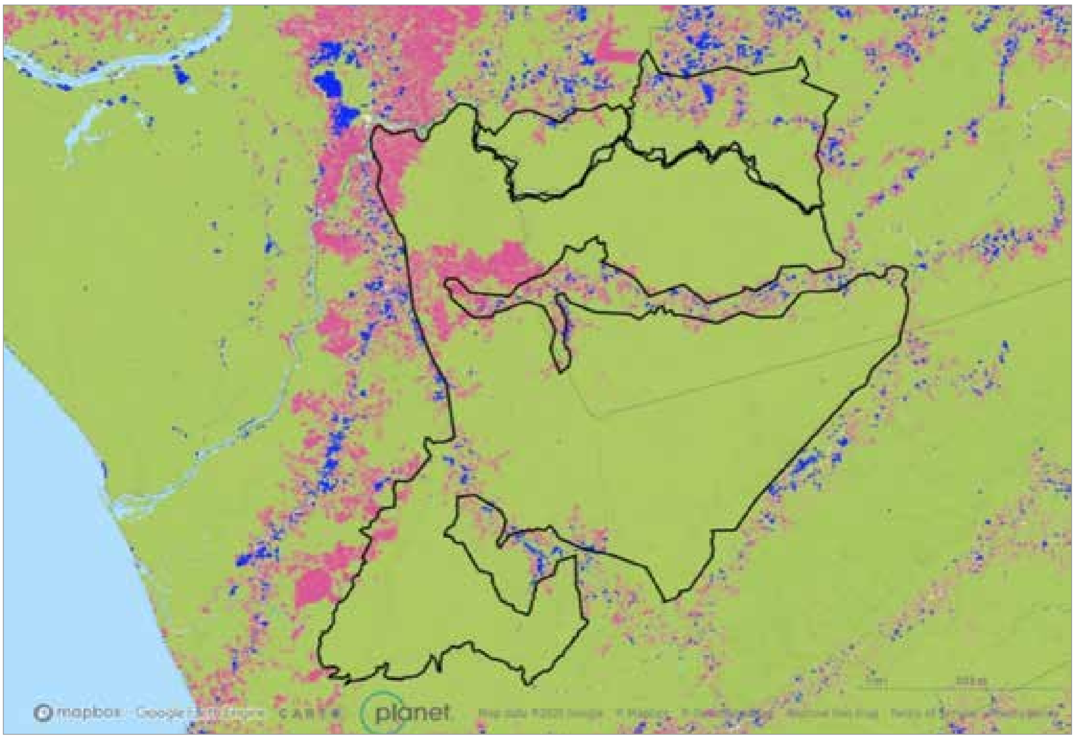
[1] For more information please visit https://www.globalforestwatch.org/

Figure 2. *Tree cover loss (indicated in pink) and gain (blue) in and around Lokoundjé-Nyong forest, 2001–2023*



Source: World Resources Institute. n.d. *Global Forest Watch*. [Cited 18 December 2024]. https://www.globalforestwatch.org/
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

tree cover between 2001 and 2023 while gaining 281 ha during the same period. **Figure 2** shows areas under significant pressure in and around the FMU, where tree cover loss has been observed in the past two decades.

2.3. Legal status and management structure

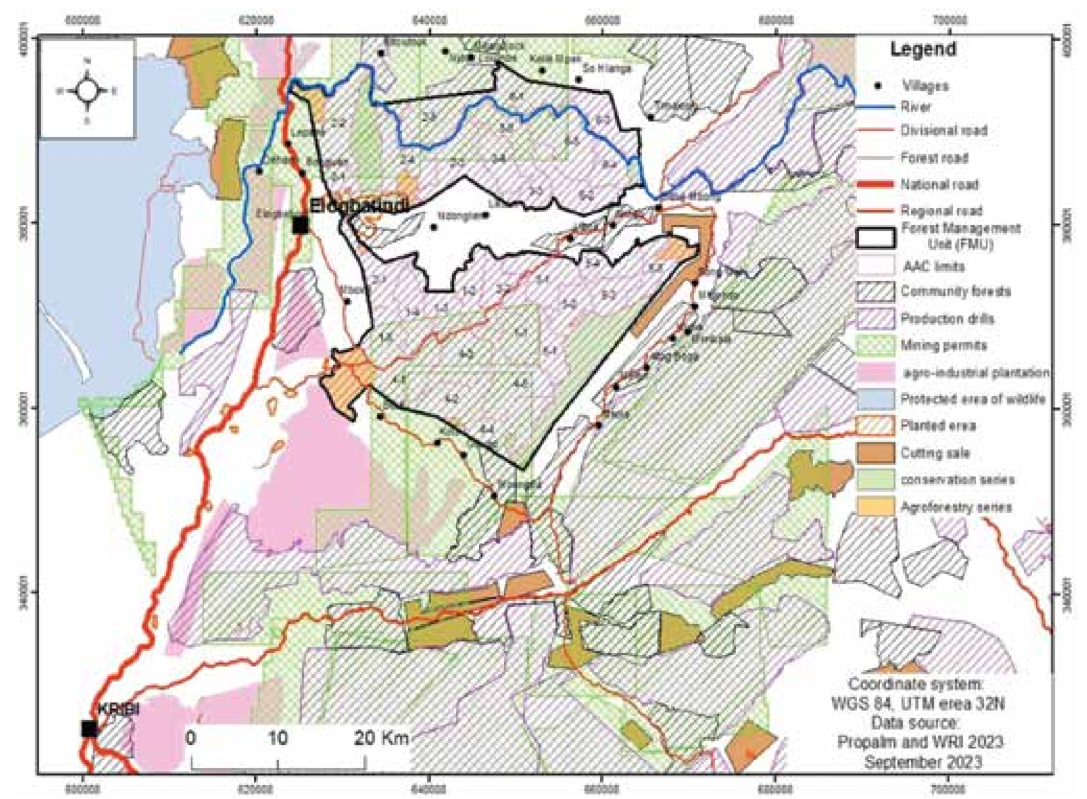
The first two known permits in the Lokoundjé-Nyong forest, with a total area of 30 000 ha, were granted in 1958. Subsequently, other five-year cutting permits were granted in the study area until 1996. As part of phase three of the national inventory, a reconnaissance forest inventory was undertaken in 1986–1987 over the entire forest area (CENADEFOR-PTI, 1988). In 1994, a forest inventory was carried out in the area and used in the development plan of the company MMG SARL, which was validated in 2004. This company exploited the Lokoundjé-Nyong forest from 2000 to 2015 – for the first three years under a provisional agreement, and from 2004 onwards based on the first management plan approved by the forestry administration.

In 2012, MMG SARL signed a contract with Compagnie Forestière de Kribi (CFK), transferring its shares to make CFK the main forest manager.

The various licenses covered the entire area of the FMU, and MMG SARL exploited large areas. However, some areas remained unexploited. In 2016, CFK acquired rights to the concession to continue its operations with a sustainable forest management approach and, ultimately, to achieve forest certification as a subsidiary of the Wijma Cameroun SA group.

In 2018 Propalm Bois, a subsidiary of the Vicwood Thanry Group, obtained the concession license for the Lokoundjé-Nyong forest. Vicwood Thanry Group is a limited liability company created in 1964 with its headquarters in the city of Douala in Cameroon. Although some of the forest holdings of Vicwood Thanry Group are FSC-certified, Propalm Bois is not

Figure 3. *Land use map of the Lokoundjé-Nyong forest and its surroundings*


Legend
Villages
River
Divisional road
Forest road
National road
Regional road
Forest Management Unit (FMU)
AAC limits
Community forests
Production drills
Mining permits
agro-industrial plantation
Protected area of wildlife
Planted area
Cutting sale
conservation series
Agroforestry series
Ebogbarindi
KRIBI
0
10
20 Km
Coordinate system:
WGS 84, UTM area 32N
Data source:
Propalm and WRI 2023
September 2023

Source: World Resources Institute & the Ministry of Forestry and Wildlife, Cameroon. 2023. *Atlas Forestier du Cameroun.* [Cited 15 October 2024]. https://cmr.forest-atlas.org/pages/a0241a620c234099bd73f25b7246863c

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

involved in any forest certification process. The site director is responsible for onsite production and coordinates development activities in association with the manager responsible for forestry activities and the forest information system.

While the FMU has been under definitive agreement signed by the prime minister since 2018, and therefore considered to be in the private forest domain of the state, it is subject to strong pressure from local communities that wish to expand their agricultural operations and other Cameroonian industrialists who also wish to extend the spaces occupied by their industrial plantations. Findings based on discussions with the staff of Propalm Bois, the village chiefs of Bella and Ebondi, and officials of the Ocean Department of the Ministry of Forestry and Wildlife are as follows:

- Inside the Lokoundjé-Nyong forest, 1 562 ha were reclassified by decree as agricultural land for the Ndomayo industrial company.
- Local communities that requested land from the government for rural activities received 3 187 ha (of the 21 552 ha declassified by the state in 2012 and handed over to Biopalm) in 2017 after a litigation process.
- There is an industrial plantation being created in the Ndoke sector whose legality is uncertain.
- In the Ngoué village sector, another industrial company has requested 5 000 ha from the government to carry out agricultural activities.[2] The company would like to have the already-exploited annual cutting area decommissioned to satisfy its demand. Correspondence has been sent by the presidency services to the Minister of

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[1] According to personal communications with leaders of a local village

Forestry and Wildlife requesting their technical opinion on this matter.

- In the annual cutting area for 2023, local communities cleared sizable areas of forest to create banana plantations and to provide plots of land to workers from the northwest, southwest and north of Cameroon who were in search of employment while fleeing the war in these regions.
- In 2018, the Bagyeli population living near the Lokoundjé-Nyong forest declared that they do not want Biopalm in their area because they were ignored in the land-sharing agreements between the industry and the forest concessionaire facilitated by the state (Ngeunga, 2019).

In 2002, the Lokoundjé-Nyong forest was still largely undisturbed when it was the subject of the first FAO evaluation as an exemplary forest management case. There are roads and villages within the Lokoundjé-Nyong forest that are maintained by the state. Current land conflicts can be partly explained by the fact that local communities had not fully understood the new types of management adopted when it was initially included in a Technical Operation Unit under the responsibility of the Ministry of the Environment and Forests (MINEF, currently the Ministry of Forests and Wildlife, MINFOF) and then an FMU managed by MMG SARL, followed by CFK, and finally by Propalm Bois from 2000 to the present day. The classification of this forest by MINEF/MINFOF as an FMU in 1997 is contested by local communities, which assert that they have not been consulted or involved in the demarcation of the FMU, which encompasses their villages, croplands and plantations (Kouagheu and Ngeunga, 2023).

2.4. Regulatory environment and government support

To supervise the forestry sector effectively, Cameroon has carried out significant reforms in the forestry sector, including:

- creation of MINEF in 1992;
- publication of the forest policy in 1993 (revised in 1995);
- adoption of Law No. 94/01 regulating forests, wildlife and fishing in 1994;
- adoption of Decree No. 95/531/PM in 1995 establishing detailed regulations on the implementation of the forest system; and
- creation of MINFOF in 2004.

The National Forestry Development Office, which became the National Forestry Development Support Agency in 2002, was responsible in the 1990s for carrying out the technical tasks entrusted to it by the state. These two public structures prepared or participated in the development of sustainable management tools for forest areas in Cameroon.

Annual forestry royalties and fees collected by the government should be at least partially reinvested in social projects to benefit the local populations. However, such benefits have not been realized according to the local communities. Propalm Bois tries to comply with the minimum legal requirements in terms of environmental, biodiversity and social protection. The Regional and Departmental Forest Delegations carry out bimonthly forest control missions to the FMU to verify legal compliance in accordance with the requirements of the forest management plan. There have been no recorded infractions in Propalm Bois' forest management activities to date.

In 2021, the forestry company Société Africaine des Bois de l'Est, which had annual rights to the timber (sale of standing volume[3]) in an area adjacent to the FMU, exploited trees inside the FMU in violation of the company's boundaries. Consequently, Propalm Bois has been formally notified by the government to redefine its FMU boundaries.

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[3] This forest title is given to some forest operators to exploit timbers in an area for only one year.

2.5. Forest management practice

Although the Lokoundjé-Nyong forest exhibited promise for future success at the time of its creation, sustainable forest management has not been realized or made a priority in the actual forest management practices. There had been no implementation of silvicultural practices, management of non-wood forest products or trees outside forests, nursery management, pest or fire control measures, or monitoring throughout the period of MMG SARL's management.

Propalm Bois carries out forest management based on forest inventory data and the requirements of the forest management plan approved by the administration, which determines exploitable species and minimum harvesting diameters. Following the inventory, the company requests an annual certificate of operation from MINFOF, which identifies the species and volumes authorized for harvest that particular year. The positioning maps of the timber to be felled help the forest managers to plan the harvesting.

From 2000 to 2023, no reforestation activities were carried out in the Lokoundjé-Nyong forest by the various concessionaires despite being included in the forest management plans approved by the forestry administration. However, Propalm Bois recently supported the renewal of the members of the Forest Peasant Committee around FMU and signed a contract with the committee at the end of 2023 to provide nursery equipment and technical assistance to install a forest nursery and plant trees.

2.6. Production and business aspects

Seventeen annual cutting areas have been exploited since the allocation of the concession, including in the area declassified in 2012. From 2017 to 2021, 268 254 ha were exploited, averaging 53 651 ha per year.

In 2004, 25 species representing 77 percent of the initial gross volume of commercial species (corresponding to 3.5 million m^3) were selected to calculate the volume available for harvesting on a 30-year rotation (La Forestière Prospecting Company, 2004). Of the 25, five species – azobé (*Lophira alata*), koto (*Pterygota* sp.), okan (*Cylicodiscus gabunensis*), red padauk (*Pterocarpus soyauxii*) and tali (*Erythrophleum* spp.) – were selected for management and harvesting.

Under the management of Propalm Bois, 30 species were selected for harvesting during the 30-year management cycle, which began in 2021. These species represent approximately 80 percent of the initial gross volume of commercial species, corresponding to 3.2 million m^3. Five species selected in 2004 for harvesting do not appear in the 2021 list, which could mean that their exploitable quota for the 30-year rotation had already been exhausted. In 2021, 12 additional species which were not part of the 2004 list were added. Expanding the range of species to be harvested can generate more value and contribute to sustainability. However, if the most valuable species are being depleted first, followed by those of slightly lower value, this approach ultimately undermines sustainability.

The revised forest management plan of 2021 aimed for an annual production target of approximately 86 702 m^3 of wood. Revenues from the sale of timber species currently on the market for the next 30 years starting from 2021 are estimated around USD 75 million, with estimated expenses around USD 71 million, which corresponds to a project net profit margin of USD 4.4 million during the management period of 30 years.

2.7. Social aspects and impacts

Village chiefs and Propalm Bois managers stated that the workers are locally recruited, provided with protective work equipment such as boots and helmets, and affiliated with the National Social Insurance Fund. Instead of group accommodation, workers receive a housing and ration bonus in their salaries.

During the COVID-19 pandemic, many employees were furloughed for more than a year due to the blockage of maritime transport that made timber export impossible. This had a negative socioeconomic impact for the employees and created financial difficulties for the company.

Before starting operations in annual cutting blocks, Propalm Bois organizes information meetings in accordance with management plan requirements. These information meetings were the only social actions undertaken by MMG SARL and CFK, former concessionaires of the FMU from 2000 to 2018. Management specifications for the Lokoundjé-Nyong forest, particularly those related to social benefits in favour of the Bagyeli indigenous populations bordering the forest, were not regularly implemented during the management of MMG SARL from 2000 to 2015.

In addition to the information meetings, Propalm Bois has made social contributions to the local communities, including by providing timber for repairing bridges, repairing a public school, constructing a meeting shed, opening a sand quarry and contributing to the establishment of a transit hub, among other initiatives. Furthermore, the company has recently signed a contract with the Forest Peasants Committees, which were set up in 2016 during the management by CFK and renewed in 2020 by Propalm Bois. The contract aims to provide equipment and technical assistance for nursery development.

Propalm Bois is the first forest company operating in the Lokoundjé-Nyong forest to carry out social projects. Because of this, the local communities have become receptive to the company's presence but would like to receive further support.

Propalm Bois has been making regular payment of the annual forestry fee since 2002, except in 2010 when non-payment was observed (Cameroun Ecologie, 2012). Under relevant regulations, half

Chief and farmers of Ebondi village

©CIFOR-ICRAF

of the annual forestry fee (or royalty) paid by forest concessionaires to the government must be allocated to the rural communes (40 percent) and the villages bordering the forest concessions (10 percent). However, due to embezzlement and mismanagement of funds provided by the state, local communities have not realized any social benefits from these annual fees to date.

2.8. Environmental values and impacts

A first environmental impact study was conducted in 2011 by Cameroun Ecologie, a non-profit national NGO. For 11 years since MMG SARL commenced forest harvesting, the company has not implemented any conservation or environmental mitigation measures. Environmental baseline data do not exist, and related mitigation measures are not indicated for the site.

Although baseline and monitoring data on biodiversity are insufficient, the Lokoundjé-Nyong forest is part of the Guinean forests of West Africa, recognized as a biodiversity hotspot. This tropical moist broadleaf forest supports a rich variety of flora and fauna. Notable wildlife present in the FMU includes artiodactyls such as red and blue duikers, water chevrotains, and red bush pigs; carnivores like civets and mongooses; pholidotes including giant and long-tailed pangolins; primates such as gorillas and chimpanzees; and proboscideans like the African forest elephant (ECARE SARL, 2021).

2.9. Challenges and threats

Several threats and challenges have been identified in the sustainable management of the Lokoundjé-Nyong forest:

- The extension of agricultural land within the concession poses a threat. This is driven by population growth and the complete takeover of the buffer zone, initially demarcated for agricultural activities by people living in the forest interior, by the surrounding communities (Yene Yene, 2002). Population growth is exacerbated by the in-migration of refugees from conflicts in the northwest, southwest and north of Cameroon, as well as of people looking for work on the Swiss farm (a chicken production company) and at the Plantation du Haut Penja (a multinational plantain production company). These groups are settling permanently in the area.
- Land inside the Lokoundjé-Nyong forest is being illegally sold by local residents.
- Illegal logging is carried out by local communities looking for additional income and by logging operators who use their "sale of standing volume" forest titles in areas bordering the concession. These operators illegally extract timber from inside the concession area, as was evident during the boundary dispute between Propalm Bois and SABE in 2021.
- There is increased pressure on the government from industrialists to grant them land in the FMU for conversion to commercial agriculture since the concession is near the port of Kribi.

2.10. Opportunities

A participatory, multistakeholder land-use planning and consultation process could be organized by the forestry administration, local communities, Biopalm, Propalm Bois and others, and a part of the annual harvesting blocks that have already been exploited could be allocated to the local communities and industries that request land for agriculture. Any allocation of land ownership or use rights should come with a clear agreement on the roles and responsibilities of the different stakeholders in protecting the remaining forest area. This will significantly reduce tensions linked to land use.

There is scope to improve the agricultural practices of local communities, and therefore enhance their livelihoods, with the possible support of responsible civil society organizations. This could help control expansion of local agricultural activities, illegal logging and land sales in the

FMU. Livelihoods could also be enhanced through sharing of the annual forestry fee, supporting community nursery operations, and providing employment opportunities in forest protection and management, among other initiatives. Propalm Bois could establish a living base for workers to offer them a decent living environment and ensure direct control over illegal activities to which they could be otherwise tempted to contribute.

In addition, there may be opportunities to develop ecotourism given the proximity of the Lokoundjé-Nyong forest to the seaside town of Kribi (a tourist destination) and the presence of places of worship in the forest.

As an exemplary forest management case study, the forest could be used by universities for research.

2.11. Partnerships

The only partnership observed is the mandatory one with the MINFOF and the Ministry of the Environment and Nature Protection and Sustainable Development. The Government of Cameroon regulates forestry activities by providing forestry operators with the technical expertise of these two ministries to support sustainable forest management and to ensure regulatory compliance.

2.12. Innovation, recognition and outreach

Propalm Bois is not involved in any forest certification process for legality or forest management. However, it has set up a timber traceability system using the "Trace" software in association with geo-referenced logging inventories.

3. KEY LESSONS LEARNED

Key lessons learned are as follows:

- It is difficult to sustainably manage a forest under concession in situations where communities are not involved in the management process and see themselves as victims. Local communities living inside the forest area need to participate in and be placed at the centre of the development process, and their well-being and livelihoods enhanced and linked to the sustainable management of the forest resources.
- Operational elements of sustainable forest management, such as environmental baseline assessments, careful planning of annual cutting areas and harvesting operations, implementation of silvicultural practices, monitoring and law enforcement, are critical to prevent forest degradation over time.
- Multistakeholder consultations and situational analyses are required to plan and implement realistic policies and effective protection measures for the area in a participatory manner, taking into account the current and potential future pressures and opportunities.

4. FUTURE OUTLOOK

The likely future scenario is a gradual degradation of the forest resources under the management of concession companies, given the limited application of sustainable forest management practices and depletion of high-value species over time.

The buffer zone initially assigned to the local communities living inside the FMU has already been thoroughly degraded and exploited. Despite carrying out several social projects for the local communities since 2020, Propalm Bois does not have an overall social programme to support local communities in improving their living conditions and does not consider this to be its primary responsibility. Substantial expansion of local agricultural activities, illegal logging and land sales in the FMU are expected to continue, as local communities have no stake in or benefit from sustainable forest management.

Land is also being allocated to industries for commercial agriculture without a clear and participatory land use planning or multistakeholder consultation process. Local communities believe that their needs are being ignored, and there are tensions and conflicts over land use.

Furthermore, current land allocations lack clear agreements recognizing, guaranteeing and ensuring responsibilities for and involvement by the different stakeholders in protecting the remaining forest areas.

The Lokoundjé-Nyong forest thus faces severe degradation and deforestation risks and could disappear before long unless local communities are immediately placed at the centre of forest management, competition over land is addressed with, and forest management practices are improved and strengthened with the participation of local stakeholders.

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CENTRAL AFRICA

STATE OF CONSERVATION OF THE LOSSI GORILLA SANCTUARY

Aimé Patrick Missamba-Lola, Marien Ngouabi University

NAME OF FOREST	**Lossi Gorilla Sanctuary**
LOCATION	**Mbomo District, West Cuvette Department, the Republic of the Congo**
AREA (ha)	**35 000**
MANAGING ENTITY	**Odzala-Kokoua-Lossi Foundation in partnership with the Government of the Republic of the Congo**
MANAGEMENT OBJECTIVES	**Provision of benefits to local communities through ecotourism and rational use of natural resources; protection of biodiversity and the forest ecosystem; research; environmental education**
FOREST TYPE	**Mosaic of sparse Marantaceae forests (66%), swamp forests (26%), dense semi-deciduous forests (7%) and secondary vegetation covering ancient village sites**

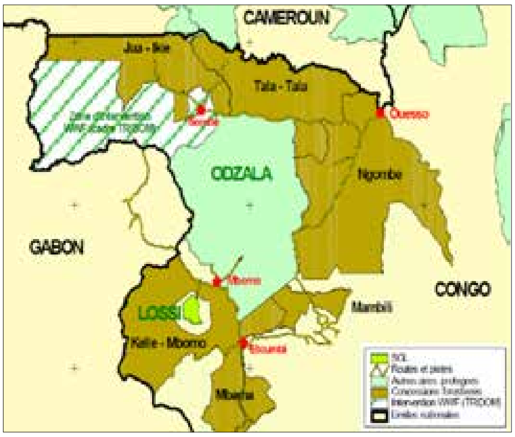
1. INTRODUCTION

The Lossi Gorilla Sanctuary was established in 2001 as a combined scientific research and nature conservation effort. Three stakeholders were involved in the creation and management processes: the Congolese State, the local population represented by the Association of Lossi Land Rights Holders (AATL) and the European programme Conservation and Rational Utilization of Forestry Ecosystems in Central Africa (ECOFAC) (Mbété *et al.*, 2007). As per the objectives of the experimental phase, the owners of Lossi's land were identified, the gorillas were habituated to human presence, and western lowland gorilla-viewing tourism was initiated. A tourist camp was built and an access road to the sanctuary was opened.

Tourism generated jobs for the local population, who were also contractors for road repair work. Part of the income enabled local communities to improve their livelihoods. An integrated health centre was also constructed; however, it no longer exists.

This report considers the changes and developments in the area over the past 20 years, updating the previous FAO *In Search of Excellence* case study (Gami, 2003a).

Figure 1. *Location of the Lossi Gorilla Sanctuary*



Note: Lossi Gorilla Sanctuary (in lime green) surrounded by forest concessions (olive). Odzala-Kokoua National Park (light green) is located in the middle of the map. Refer to the disclaimer on page ii for the names and boundaries used in this map.

Source: ECOFAC. 2010. *Management Plan of the Lossi Gorilla Sanctuary*. Internal document

2. MAIN CHANGES AND DEVELOPMENTS

2.1. Management objectives

According to the terms of the decree (Decree No. 2001-222) that created the Lossi Gorilla Sanctuary, this nature reserve is to be managed for preservation of the forest ecosystem in its natural state, conservation and sustainability of natural gorilla populations, and habituation of gorillas to human presence for the promotion of ecotourism and scientific research.

Management objectives expanded in 2020 with the Lossi Gorilla Sanctuary coming under the management of the Odzala-Kokoua National Park unit. The original partnership agreement signed in 2012 between the Congolese State and the Odzala-Kokoua Foundation (now Odzala-Kokoua-Lossi Foundation) was revised in 2020 to develop ecotourism concessions and provide new sources of revenue to local populations. However, these objectives assigned to the Lossi Gorilla Sanctuary have not been realized yet.

The development and management plans were revised, reconciling conservation, local development and scientific research while guaranteeing an equitable distribution of income between the partners. This revival involves obtaining funding and balanced management between the Lossi Gorilla Sanctuary and the Odzala-Kokoua park, with emphasis on the assignment of permanent eco-guard teams and more sustained involvement of local populations.

2.2. Forest type and condition

The Lossi Gorilla Sanctuary is delimited by natural landmarks and paths. There are no other permanent boundary markers. Given the lack of ecological monitoring, it is difficult to estimate the state of natural resources (fauna and habitat) at present. There is strong poaching pressure in this area and no ongoing management activities.

A sanctuary agent in Mbomo reported that the forest area had not changed. But the sanctuary was abandoned in 2013 and 2014 mainly because of a lack of funding. Since then, a few eco-guard patrols have been sent out to monitor the gold panning and hunting rampant in the area. The forestry operator Congo Dejia Wood Industry was to maintain a 5-kilometre harvesting buffer around the sanctuary to prevent machine noise from impacting wildlife. However, due to lack of monitoring, there is no information on whether the operator respected the limits.

The sparse Marantaceae forests that dominate the sanctuary are full of food sources for the gorilla, but do not have a significant density of marketable timber species.

2.3. Legal status and management structure

At the end of the ECOFAC programme, the conservator of the Odzala-Kokoua National Park was also appointed conservator of the Lossi Gorilla Sanctuary. In the exercise of his functions, he is assisted by two deputies (curators): one for the Odzala-Kokoua National Park and another for the Lossi Gorilla Sanctuary. The Association of Lossi Land Rights Holders from the Lengui-Lengui, Moangui and Ombo villages has remained one of the main players in the partnership, though sanctuary management has not been truly participatory, according to the members.

For conservation activities, the Government of the Republic of the Congo supports a technical cooperation approach, through the Congolese Agency for Wildlife and Protected Areas (ACFAP), placed under the authority of the ministry in charge of forests, which manages all protected areas with technical and financial partners (Law 34-2012; Decree No. 2013-17 approving the ACFAP statutes). To this end, the Odzala-Kokoua Foundation, created in 2012, is an outcome of a partnership agreement signed between the government and the NGO African Parks Network, through which management of the Odzala-Kokoua National Park was established for a period of 25 years.

Since 2020, the Lossi Gorilla Sanctuary area has also been managed by the park management unit. The board of directors has nine seats (three occupied by the African Parks Network and six by community representatives including AATL, the government, the Réseau des aires protégées d'Afrique and Leadership for Conservation in Africa). A director supervises the activities of the curators of the Lossi Gorilla Sanctuary.

2.4. Regulatory environment and government support

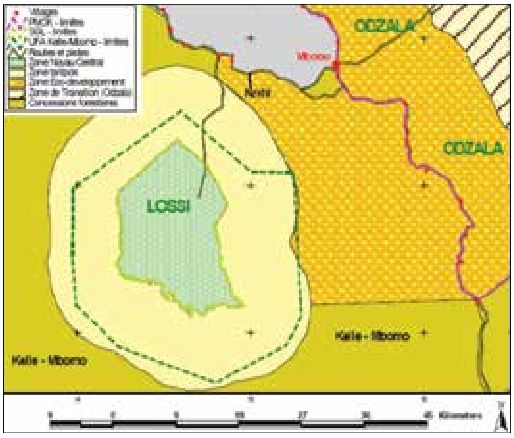
Law No. 43-2014, relating to the orientation for planning and sustainable development, stipulates that "the State implements a land allocation policy which guarantees the concomitant development of the different sectors of activities and respects the different forms of land ownership." This law facilitates, among other things, the management of overlapping land use in several sectors, including agriculture, mining and forestry. This law is supported by Decree No. 2009-304 creating an interministerial consultation committee in the event of overlapping uses in natural ecosystems. Decree 2017-227 establishes the composition, organization and operation of the interministerial committee for territorial planning and development, and Decree 2017-226 establishes the national council responsible for setting the guidelines for the development and implementation of the territorial planning policy.

In February 2011, the government adopted a new law (Law No. 5-2011) on the protection and promotion of Indigenous Peoples. The law states that "the State ensures that indigenous populations are consulted in an appropriate manner" and provides a legal basis for securing their civil, political and cultural rights as well as rights to land and resources. Article 31 states that Indigenous Peoples have an individual and collective right to ownership, possession, access to and use of the lands and resources they traditionally use.

However, the decree that created the sanctuary in 2001 specifies that the sanctuary is purged of any right of use, although exemptions can be granted to the rights holders of Lossi land, only for uses of natural resources which do not have a negative impact on gorillas and their habitat. The internal regulations of the sanctuary specify the functioning of its management committee, the rights and duties of workers and all activities prohibited in the protected area (Article 40) in accordance with the zoning described in the development plan.

The development plan specifies the usage rights in the different management zones of the protected area and its periphery. It also details the process of establishing the institutional framework for co-management of natural resources with local communities. The management plan was built based on the analysis of the heritage values of the protected area and appears functional and realistic. However, it has not been implemented due to inadequate funding. The African Parks Network emphasizes in its public communications that concrete measures are being taken to improve

Figure 2. *Zoning of the landscape around Lossi Gorilla Sanctuary*



Note: The Lossi Gorilla Sanctuary (in light blue-green) is surrounded by a buffer or transition zone. Forest concessions appear in olive, and the eco-development zone appears in dotted pattern. Refer to the disclaimer on page ii for the names and boundaries used in this map.

Source: IUCN/PACO. 2012. *Parcs et réserves du Congo: évaluation de l'efficacité de gestion des aires protégées.* Ouagadougou. https://portals.iucn.org/library/sites/library/files/documents/2012-089.pdf

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Electric fence against the elephants that devastate crops around Mbomo

the participation and representation of local communities in management decisions.

The Lossi Gorilla Sanctuary is patrolled only intermittently since the eco-guard teams have been deployed to Odzala-Kokoua Park and no longer work under the direct supervision of the Lossi curator. Furthermore, the curator has an office at the headquarters of Odzala-Kokoua Park in Mbomo and has no means of travel to the sanctuary.

2.5. Forest management practices

Hunting and gathering are the main activities from which the communities surrounding the Lossi Gorilla Sanctuary derive their livelihoods. The most commonly harvested wild animal species are antelopes (duikers), rodents (cane rats) and suids (red-backed pigs). Subsistence agriculture is practiced to a lesser extent, concentrated mainly on the cultivation of cassava. Most of the farming processes and techniques used weaken the balance of ecosystems. Among the alternative activities proposed but not yet tested are market gardening (i.e. small-scale cash crop production), growing food crops, and small-scale livestock breeding (Mampouya, 2000; Mbété, 2003).

However, elephants currently pose a significant threat to food crops in the area, generating tension between park managers and farmers. The latter sometimes feel wronged and claim that conservation objectives take precedence over their well-being. To mitigate the conflict, an electric fence was installed to repel the elephants, particularly around the town of Mbomo.

The public–private partnership between the manager, public administration and local communities seeks to guarantee sustainable forest management and find solutions favourable to all. However, the lack of adequate resources hampers management activities, including controlling access to the area, promoting ecotourism (Pyhälä *et al.*, 2016) and training trackers (Conservator of Lossi, personal communication).

According to the communities, since the end of the ECOFAC programme in 2008, the following activities experienced a significant decline: development of communication and health infrastructure; marketing of agricultural products; employment opportunities; gorilla-viewing tourism; the fight against poaching; and development of alternative activities to hunting. Eco-guard patrols are only carried out sporadically.

2.6. Production and commercial aspects

The subdivision of Mbomo has a market where the population of the villages bordering the sanctuary come to sell their food, bushmeat and other products.

The American tourism operator Kamba African Rainforest Experiences[1] (formerly Congo Conservation Company) has established an agreement with the Ministries of Forestry Economy and Tourism relating to the Odzala-Kokoua National Park and the Lossi Gorilla Sanctuary for the development of ecotourism concessions. The company has committed to investing 5 percent of its revenues in a fund addressing the development needs of local populations. An action plan specifies the conditions for carrying out economic and commercial activities, including ecotourism. However, the managers of the company have not yet considered installing tourist infrastructure in Lossi. On the outskirts of the Lossi Gorilla Sanctuary, three groups of gorillas have been accustomed to human presence on the Gaga site, which collaborates with Kamba African Rainforest Experiences.

2.7. Social aspects and impacts

The Lossi Gorilla Sanctuary was started by the residents of Lengui-Lengui, Moangui and Ombo villages (Gami, 2003b), proof that collaboration with communities can lead to positive developments. Despite this promising start, local communities barely participate in management decisions or benefit economically from this protected area.

One of the reserve managers shared that open and effective community participation in decision-making regarding reserve management, community development and environmental education is essential to the success of conservation actions. The Odzala-Kokoua-Lossi Foundation emphasizes in its public communications that "concrete measures are taken to improve the participation and representation of local communities in management decisions". However, community members and other development actors indicate that, since the creation of the protected area, consultation was undertaken only at the time of management plan development and communities do not participate effectively in decision-making.

The community is organized around the AATL. Although the land ceded to the Lossi Gorilla Sanctuary belongs to the AATL, a local natural resources management committee involving the AATL and the rest of the local population is essential and must be established according to the original agreement (Mbété *et al*., 2007). It is precisely this committee that would become the valid interlocutor for negotiations and for signing the sanctuary management contracts. The village should be considered the main unit of natural resources management, both for land and for wildlife. However, the AATL is currently struggling to function because of lack of funding.

Community members have not earned much income from reserve activities other than through sporadic employment as eco-guards or tourist guides. On the ground, few measures in favour of local development have been put in place, even to constitute fair compensation for the loss of certain means of subsistence. In fact, the projects to develop income-generating activities to improve the well-being of local populations described in the management plan have never been carried out. "Support has been provided to local communities from the protected area in cases of illness, children's schooling, etc. In the event of death, a vehicle is provided for various errands and sometimes money too, if necessary", stated the curator of Lossi. "The reserve has been assisting or supporting the population during cultural activities (circumcision) through its community development service since 2020."

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[3] For more information please visit https://kambaafrica.com/

The community development service of Odzala-Kokoua Park carries out awareness-raising actions regarding the permitted hunting periods, and environmental education for children (called holiday clubs). On the initiative of the Foundation, nearly 200 children from neighbouring villages went through the awareness raising campaigns this year in Mbomo.

The study *Effectiveness of Protected Area Management* (IUCN/PACO, 2014) reported, among other things:

- the absence of a participatory conflict-management mechanism linked to forest management;
- the absence of clear provisions on reparations and compensation in the event of restrictions on customary forest ownership and use rights for local communities and indigenous populations; and
- the absence of appropriate mechanisms for compensation for damage caused by wild animals on crops grown by local communities and indigenous populations.

In the field, the Foundation has a human–wildlife conflict management department, which works in collaboration with the state agricultural and forestry services to report on damage caused by animals. This joint work resulted in the establishment of damage compensation rates per square metre instead of per square foot, which discouraged communities from undertaking agricultural activities.

In 2002, the park established devastation insurance for crop damage through voluntary membership of local farmers following awareness-raising. This insurance is based on the 1970 decree on crop devastation. A park team makes a preliminary demarcation of the plantation to determine the area occupied by the crops. The forestry economy brigade, in collaboration with the head of the agriculture sector, at the local level, then takes over the application of the 1970 decree and payments. However, the amounts provided for by this decree are not attractive for the farmers. Three payment scales are defined: areas up to 1 ha are insured for an amount of Central African franc (XAF) 2 500 (USD 4); from 1.1 to 2 ha for XAF 5 000 (USD 8); and from 2.1 to 3 ha for XAF 7 500 (USD 12). Compensation was estimated at XAF 200 000 (USD 324.4) for 50 percent of the surface area of the field destroyed by animals, XAF 100 000 (USD 162.2) for 25 percent and XAF 10 000 (USD 16.2) for 10 percent.

2.8. Environmental values and impacts

In addition to its primary function as a gorilla sanctuary, the Lossi Gorilla Sanctuary offers many other products and ecosystem services to local

Focus group discussion in the village of Lengui-Lengui

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populations such as edible mushrooms, wild fruits, medicinal plants, firewood, soil protection through the plant cover, and the ability to generate tourist income, although the latter has not yet developed.

Bio-indicators have been developed and detailed in the management plan that make it possible to verify that the planned activities have been carried out. However, there are no impact indicators to measure the results of these activities (for example the anti-poaching efforts) on resource conservation (IUCN/PACO, 2014).

2.9. Challenges and threats

The lack of funding, illegal hunting and the recurrent outbreaks of Ebola haemorrhagic fever which decimated part of the gorilla community between 1983 and 2000 are elements to consider in continued sanctuary management (Bermejo, 1999; Mbété *et al.*, 2007). According to the Lossi curator,

> *The return of gorillas and elephants should be preserved at the risk of exposing them to poaching. If effective anti-poaching activities are not undertaken on the southeast side (towards Kellé), the reserve could face significant threats. In addition, the boundaries of the park are full of valuable forest species (sapelli, Entandrophragma cylindricum; sipo, Entandrophragma utile) which can be coveted by logging companies.*

At the community level of Lossi, current debate concerns a land claim by a minority family not in favour of conservation. In addition, youth migration to urban areas has resulted in the villages of Lossi becoming increasingly depopulated and characterized by an ageing population. This demographic shift has led to a reduction in able-bodied labour to serve as eco-guards, tourist guides and workers to open trails or access routes.

2.10. Opportunities

Opportunities to improve the management of the Lossi Gorilla Sanctuary and to enhance the flow of benefits to local communities include the following:

- presence of a public–private partnership for the management of the Lossi Gorilla Sanctuary;
- strong interest in conservation of the Lossi site by local communities;
- current integrated approach to conservation while contributing to sustainable development goals, hence the possibility of mobilizing financing;
- existence of technical and financial partners who can intervene;
- possibility of relaunching ecotourism; and
- existence of institutions able to carry out conservation research.

2.11. Partnerships and collaborations

The main actors of the partnership are as follows:

- the Congolese State through the ministries in charge of the forest economy, the environment, mines, finances, budget, agriculture and livestock, and tourism;
- the Odzala-Kokoua-Lossi Foundation; and
- the rural community represented by the AATL from the villages Lengui-Lengui, Moangui and Ombo, which initiated the sanctuary.

2.12. Innovation, recognition and influence

The participatory management process of the gorilla sanctuary undertaken in Lossi with local populations constitutes an innovation in the conservation of protected areas in Central Africa, despite the difficulties of relaunching activities and ensuring true collaboration.

Research outcomes on the habituation of gorillas to human presence were the subject of sharing and exchange.

Research on the diet of gorillas has shown that they are mainly frugivorous, thus needing an extended home range over long distances. It was established that tracking their movements daily is the only way to guarantee sightings of gorillas for tourists. It requires training of excellent trackers and expertise in habituating gorillas to human presence.

3. MAIN LESSONS LEARNED

The local population remains truly committed to the conservation of the Lossi Gorilla Sanctuary through the voluntary actions they regularly carry out against poaching. However, effective community participation in decision-making regarding reserve management and community development, adequate resources and training, and equitable benefit-sharing is required to ensure successful conservation and sustainable development.

The synergy between scientific research and nature conservation remains a valuable model at the national and subregional levels (Gami, 2003c; Gami, 2017; Mbété *et al*., 2007).

4. FUTURE OUTLOOK

According to ACFAP, this year's budget includes the relaunch of activities at the sanctuary level, the release will take place after the holding of the board of directors meeting that was held at the end of 2023. Negotiations for collaboration with NaturAfrica, replacing ECOFAC, were also initiated as well as the establishment of a scientific laboratory.

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CENTRAL AFRICA

CURBING THE PRESSURE ON BIODIVERSITY AND ENDANGERED SPECIES: LUBA CALDERA SCIENTIFIC RESERVE IN EQUATORIAL GUINEA

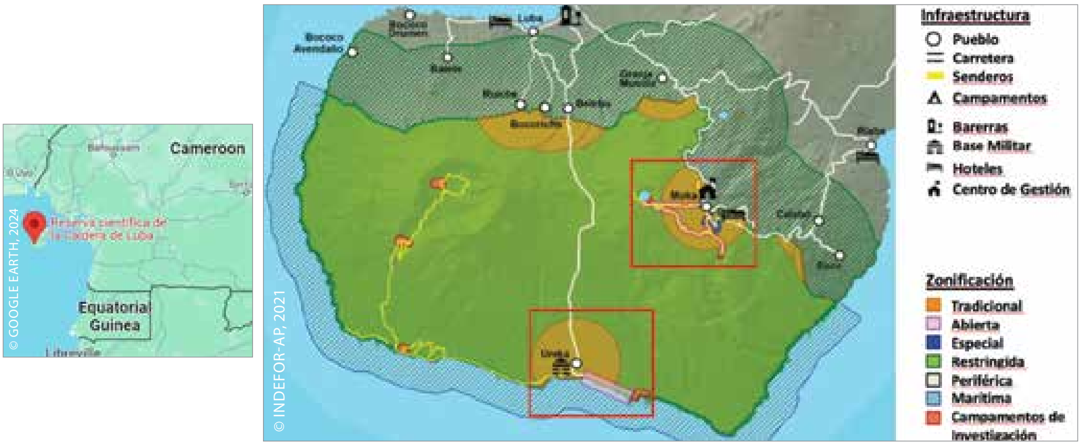
Richard Sufo Kankeu, CIFOR-ICRAF

NAME OF FOREST	Luba Caldera Scientific Reserve
LOCATION	Luba, Bioko South, Equatorial Guinea
AREA (ha)	62 900 (51 000 land and 11 900 marine)
MANAGING ENTITY	National Institute for Forestry Development and Management of the Protected Areas System (INDEFOR-AP) reserve conservator
MANAGEMENT OBJECTIVES	research; protection and integrated management of natural resources; enhanced contribution to the local and national economy; provision of ecological and environmental services
FOREST TYPE	Natural tropical rainforest

1. INTRODUCTION

The Luba Caldera Scientific Reserve in Equatorial Guinea is host to unique, rare natural phenomena, formations and areas of outstanding natural beauty that require protection and preservation to safeguard their resources. This reserve holds exceptional significance, including its high biological diversity, many resources unique to the area, and its physiographic and hydrographic complexity. It provides important ecological services, serves as a site where cultural values are preserved and features superlative natural phenomena that may

Figure 1. *Location of Luba Reserve and adjacent villages*


Cameroon
Reserva científica de la Caldera de Luba
Equatorial Guinea
Libreville
© GOOGLE EARTH, 2024
© INDEFOR-AP, 2021
Luba
Moka
Ureka
Batete
Belebu
Riaba
Infraestructura
Pueblo
Carretera
Senderos
Campamentos
Barerras
Base Militar
Hoteles
Centro de Gestión
Zonificación
Tradicional
Abierta
Especial
Restringida
Periférica
Marítima
Campamentos de investigación

Notes: White lines indicate roads, footpaths are in yellow and the olive semicircles are areas designated for traditional use. Refer to the disclaimer on page ii for the names and boundaries used in this map.

Source: Google. n.d. *Google Maps.* [Cited 18 December 2024]. https://www.google.com/maps; INDEFOR-AP (Instituto Nacional de Desarrollo Forestal y gestión del sistema de Áreas Protegidas). 2021. *Propuesta del Plan de Mane jo de la Reserva Científica de la Caldera de Luba.*

Mandrill (Mandrillus sphinx) *in Luba Caldera Scientific Reserve*

make it a UNESCO World Heritage Site (Biosphere Reserve). Additionally, the reserve holds great potential for ecotourism.

The southern slopes of Bioko Island, where Luba Reserve is located, encompass different types of ecosystems along the elevation gradient, including mangroves, swamp and floodplain forests, tropical lowland rainforests, subalpine formations and high-altitude grasslands. The reserve holds substantial biological diversity in a relatively small area. It is believed to be home to most of the species on Bioko Island, supporting at least 11 primate, 2 000 plant, 198 bird, 52 reptile and 32 amphibian species (Eisentraut, 1964; Myers *et al*., 2000; Oates *et al*., 2004; Velayos *et al*., 2013; Zafra-Calvo *et al*., 2008).

This report describes the changes that have occurred in the Luba Caldera Scientific Reserve and the vicinity over the past 20 years since the first FAO review (Ekobo, 2003).

2. KEY CHANGES AND DEVELOPMENTS

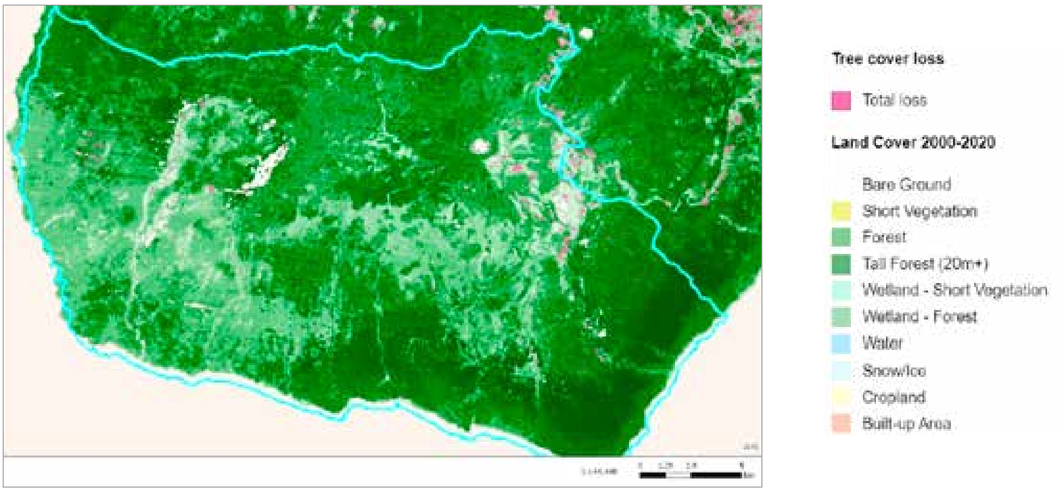
2.1. Management objectives

The overall objectives are to ensure the study, protection and integrated management of the natural resources of the reserve and its peripheral area. These objectives aim to enhance the contributions these resources make to the local and national economies while supporting ecological and environmental services (MAGBMA and INDEFOR-AP, 2023). The objectives of the Luba Caldera Scientific Reserve have not changed since its creation in 2002.

2.2. Type and condition of forest and scale of operation

The reserve was originally established on 51 000 ha of land in South Bioko Province, an area with over 90 percent forest cover. The reserve occupies approximately 40 percent of the land area of the province. In recent years, interest in marine turtle

Figure 2. *Tree cover loss between 2001 and 2023 (blue outline is the reserve boundary)*



Notes: White lines indicate roads, footpaths are in yellow, and the olive semicircles are areas designated for traditional use. Refer to the disclaimer on page ii for the names and boundaries used in this map.
Source: World Resources Institute. n.d. *Global Forest Watch*. [Cited 18 December 2024]. https://my.gfw-mapbuilder.org/v1.latest/

conservation and the development of a new management plan – currently under validation by the prime minister's office – prompted the government to expand the reserve by adding an 11 900-ha maritime strip, bringing the total area to 62 900 ha.

The new management plan incorporates zoning designed to promote sustainable management. The reserve's six zones are designated as the restricted zone, traditional zone, open area, maritime area, special zone and peripheral zone. The five zones located within the boundaries of the reserve (exclusive of the maritime area) are important for protecting critical habitats, ecosystems and ecological processes. This zoning system separates conflicting human activities and protects the natural qualities of the reserve, while allowing certain human uses. The zoning framework is based on scientific research and consideration of indigenous activities in the reserve and its riparian areas.

Based on analysis performed on the Global Forest Watch platform, there was minimal tree cover loss in the reserve over the past 20 years, with a total loss of 456 ha and a gain of 123 ha (**Figure 2**). The primary cause of this loss is slash-and-burn agriculture in and around the villages of Moka.

2.3. Legal status and management structure

The Law of Protected Areas designates the Caldera de Luba as a Scientific Reserve, which, according to the IUCN cataloguing, receives the denomination of "wild areas". These wild areas are defined as large regions, minimally modified or entirely natural, with no permanent or significant human presence, intended to be protected and managed to preserve their natural conditions or significance. However, this classification no longer accurately reflects the current state of the reserve because of the presence of a village (Ureka), roads and tracks (around Belebu and Moka), and the development of a beach. These major changes occurred after the FAO's first review.

The reserve is still managed by staff from the National Institute for Forestry Development and Management of the Protected Areas System (INDEFOR-AP) under the Ministry of Agriculture, Livestock, Forestry and Environment. The staff is composed of a curator/director, an assistant curator and a research assistant. They receive support from the Bioko Biodiversity Protection Programme (BBPP), created by the National University of Equatorial Guinea and Arcadia University. The BBPP carries out regular biomonitoring work in the reserve.

The reserve has been classified and belongs to the state of Equatorial Guinea. However, there is no clear, marked boundary in the riverside villages, and the local people are unaware of their rights and the boundaries of the reserve, despite awareness-raising campaigns. Since the last FAO review, this lack of clarity, coupled with the increased demand for bushmeat, creates a climate of mistrust between the reserve's conservation teams and the local population.

2.4. Regulatory environment and government support

The Luba Caldera was identified as one of the priority areas for conservation in studies conducted through the Spanish cooperation programme and later by the IUCN in the 1980s and early 1990s. In 2000, the government approved Law No. 4/2000 on Protected Areas of Equatorial Guinea, which officially recognized the 13 protected areas and respective categories proposed by the project Rational Conservation and Utilization of the Forest Ecosystems (*Conservación y Utilización Racional de los Ecosistemas Forestales de Guinea Ecuatorial*). The richness and extent of the country's forests make them an important natural capital for the population and for the national economy (MAGBMA and FAO, 2018).

Other laws, decrees and strategies to regulate the conservation, protection and management of natural resources include the following:

- Decree Law No. 6/1990 establishing the National Committee for the Protection of the Environment;
- Law No. 1/1997 on the Use and Management of Forests;
- Law No. 1/2000 for the Revision of Taxes on the Export of Timber;
- Law No, 4/2000 on Protected Areas in Equatorial Guinea;
- Decree No. 60/2002 creating INDEFOR-AP;
- Law No. 10/2003 regulating fishing activities in the Republic of Equatorial Guinea;
- Law No. 3/2007 regulating water and coasts in Equatorial Guinea;
- Law No. 4/2009 on the Land Tenure Regime in Equatorial Guinea;
- Decree Law No. 130/2004 on the Regulations for the Application of the Law Regulating Fishing Activities in Equatorial Guinea;
- Decree Law No. 148/2005 creating the Faculty of Environment at the University of Equatorial Guinea;
- Decree Law No. 171/2005 approving the Strategy and Action Plan for the Conservation of Biodiversity in Equatorial Guinea;
- Decree Law No. 172/2005 on Trade in Endangered Species of Wild Flora and Fauna in the Republic of Equatorial Guinea;
- Decree Law No. 173/2005 regulating environmental inspection;
- Decree Law No. 61/2007 prohibiting the export of wood logs and providing for 100 percent coverage of timber processing (three stages);
- Decree Law No. 72/2007 prohibiting the hunting, sale, consumption and possession of monkeys and other primates in the Republic of Equatorial Guinea; and
- National Environmental Strategy 2010–2020.

The new management plan under validation at the prime minister's office since 2022 gives priority to the conservation of the reserve under the responsibility of INDEFOR-AP. This institute is responsible for the management of protected areas in Equatorial Guinea and will ensure coordination with the rest of the administration and with the different socioeconomic sectors that interact with the protected area.

2.5. Forest management practices

Until now, the reserve has been managed by INDEFOR-AP's conservation department, but the department lacks the human resources, technical capacity and working materials for effective management. The reserve was governed by the various laws and decrees relating to conservation, but there was no management plan. Several structures, such as the BBPP and the Bioko Marine Turtle Programme were created to help the conservation department with biomonitoring, monitoring of other parameters and biodiversity conservation. For more than two decades, these organizations have been working on monitoring mandrill, marine turtles and other wildlife.

The reserve authorities and government delegates from Luba and Moka report the presence of poachers in the villages of Belebu, Calabo, Eoco, Luba and Moka. There are no eco-guards to raise awareness and combat poaching inside the reserve.

Under the new management plan currently being validated, management structures will be set up to ensure sustainable management of the resources and provide surveillance, patrol and logistics services (INDEFOR-AP, 2021). The organization chart provides for a conservation department with the following units: administrative and financial, management and vigilance, research and ecological monitoring, ecodevelopment, ecotourism, training and awareness, and logistics and maintenance. A director, who is the top manager and has a deputy and an accountant, will coordinate the services and activities, oversee the administration, and ensure good relations between the different governmental and non-governmental bodies as well as direct partners operating in the area.

Collection of non-wood forest products (NWFPs) in the reserve, which include medicinal plants such as *Prunus africana* (African cherry) and *Enantia chlorantha*, as well as food plants such as *Piper guineense* (black pepper or bus pepe) and *Dacryodes edulis* (atanga), are only allowed for subsistence or domestic purposes (MAGBMA and INDEFOR, 2023). In Moka and Ureka, several associations have been set up to collect NWFPs; however, their activities are still in their infancy and poorly supervised.

2.6. Production and business aspects

The main activities in the reserve are tourism and research. Funding for research activities comes from the BBPP, Drexel University (in the United States), the National University of Equatorial Guinea (UNGE) and the Bioko Marine Turtle Program. In collaboration with Purdue University (in the United States), the Bioko Marine Turtle Program has developed sustainable economic opportunities and a long-term vision that includes the well-being of the people who live in the reserve.

The BBPP's mission is to conserve Bioko Island's biodiversity, especially its critically endangered primates and nesting marine turtles, through the development of economically self-sustaining programmes that demonstrate the value of conserving Equatorial Guinea's unique wildlife

Luba Reserve Research Centre in Moka

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REPÚBLICA DE GUINEA ECUATORIAL
MINISTERIO DE AGRICULTURA, GANADERÍA, BOSQUES Y MEDIOAMBIENTE
RESERVA CIENTÍFICA DE LA CALDERA DE LUBA
PLAYA DE SOBE
HÁBITAT SENSIBLE
ZONA DE ANIDACIÓN DE TORTUGAS MARINAS
¡CUIDADO!
LAS MAREAS Y LOS RÍOS SON PELIGROSOS
ACCESO Y ACTIVIDADES RESTRINGIDAS POR CATEGORÍA DE PERMISO
NO DEJE BASURA EN LA ZONA Y RESPETE LA NORMATIVA

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Marine turtle conservation

and wild spaces. A series of training courses was offered in the production of art objects using local materials. These objects are sold through a vast network of shops and hotels in Malabo.

Tourist access to the reserve is regulated by a rule issued by the Ministry of Tourism and INDEFOR-AP. Foreign tourists pay a fee of CFA franc (XAF) 20 000 (USD 34) while domestic tourists pay XAF 10 000 (USD 17) to INDEFOR-AP and the Ministry of Tourism. Data was not available on total income collected from tourism. The inhabitants of Ureka state that they do not benefit from the massive influx of tourists and researchers to their locality since they do not receive a share of the tourist fees, that the area lacks tourist infrastructure and that most tourists are "day trippers" who do not stay for long. In addition, the guides come from Malabo or are provided directly by INDEFOR-AP.

Though prohibited in the reserve, the Bubi, Bantu and Fang peoples hunt for bushmeat, which is their main source of protein. Bushmeat and fish products are also sold on the Luba and Malabo markets, while NWFPs are used primarily for household consumption. It should be noted, however, that the construction of the Luba-Ureka Road has been an opportunity to increase trade and the number of tourists visiting Ureka's beach (Branch *et al*., 2022).

2.7. Social aspects and impacts

All riparian communities depend on the forest, with their main activity being slash-and-burn agriculture. Local communities state that access to the reserve is restricted and that they do not benefit from the forest. They are not permitted to open new plots of farmland or to take part in activities that could impact forest cover.

The new management plan, which includes various development services, is expected to contribute to increased household income from trade, tourism and agriculture.

The research centres in Moaba, Moka and Ureka recruit temporary and permanent biomonitoring staff from local communities. Hosting national researchers from UNGE, Drexel University, Purdue University, BBPP and the PTMB has helped develop the localities where the researchers live. There is also a process of knowledge transfer among experts, researchers and local players. In recent years, students at the master's, engineer and bachelor's levels coming from towns (e.g. Bata, Malabo) have been trained at these centres.

2.8. Environmental values and impacts

The creation of the Luba Reserve has made it possible to curb pressure on the resources and endangered species in the reserve. But in the absence of a management plan and effective organizational structure, those working in the reserve have seen an increase in poaching of marine turtles, Western red colobus (*Piliocolobus badius*) and mandrills (*Mandrillus sphinx*). "Since I started working on Bioko 20 years ago, I have seen an increase in the density of traps in the forest and frequent incursions by poachers", says the director of Drill Films,[1] one of whose missions is to bring the charismatic and endangered drills to the international stage to raise

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[3] For more information please visit www.drillfilms.com

Leatherback turtle (Dermochelys coriacea) *in Luba Caldera Scientific Reserve*

much-needed awareness of their existence and their fight for survival.

There are fewer than 1 200 Western red colobus left on Bioko, and the species is estimated to have declined by more than 80 percent between 1986 and 2016 (Linder *et al.*, 2021). For mandrills, field and market surveys suggest that between 3 000 and 4 000 animals remained in 2013, while further field surveys and ecological niche modelling estimate their population at 800 individuals in 2016. The latter estimate would represent a population decline of 70 percent since 1986.

The new management plan is expected to contribute to the sustainable management of natural resources in the protected area, including the endangered species, while providing alternative livelihoods by enhancing household income from trade, tourism and agriculture.

2.9. Challenges and threats

The Luba Reserve contains the population range of seven monkey species in Africa that are on the IUCN Red List of Threatened Species: *Mandrillus leucophaeus*, *Colobus satanas*, *Procolobus pennantii*, *Cercopithecus erythrotis*, *Cercopithecus pogonias*, *Cercopithecus nictitans* and *Allochrocebus preussi* (Cronin *et al.*, 2016; Cronin *et al.*, 2015; Branch *et al.*, 2022; Miller *et al.*, 2021; MAGBMA and INDEFOR, 2023). Mandrills, sea turtles and the Western red colobus are also endangered, with the red colobus considered one of the world's most endangered primates and classified by IUCN as critically endangered.

Commercial poaching and uncontrolled mass tourism are major threats to the reserve. Shotgun hunting has been identified as the greatest threat to the megafauna of the reserve, thus being the main cause of the reduction in primate populations. Most of these hunters come from the hinterland and are mainly of Fang ethnicity, associated directly or indirectly with military personnel and their economic partners (Meñe, 2016), and using local guides and facilitators (Reid *et al.*, 2005).

Branch *et al.* (2022) identified 596 gunshots from sensors recording continuously between January 2018 and January 2020. Occupancy modelling showed that hunting increased with decreasing terrain heterogeneity and decreasing distance to roads and villages, and decreased with increasing proximity to research camps. These results demonstrate that increasing accessibility increased primate hunting in reserve (Branch *et al.*, 2022; Cronin *et al.*, 2015; Cronin *et al.*, 2016; Cronin *et al.*, 2017). Data collected over 13 years showed that bushmeat hunting had a significant negative impact on monkey populations and there was a poaching hotspot in the southwest of the reserve (Cronin *et al.*, 2017).

The reserve was fragmented into two parts by the paved road connecting Luba and Ureka constructed in 2015 (Branch *et al.*, 2022), expanding and facilitating access into the reserve. This road is a threat to both fauna and flora, but at the same time represents an opportunity for ecotourism and the livelihoods of the people of Ureka (Miller *et al.*, 2021). There are also areas of pressure on marine turtles on the beaches and on fauna along the roads, in the villages of Belebu, Eoco, Moka and Ureka.

A significant decrease in primate density is expected over the next decade, including the potential extinction of the critically endangered Pennant's red colobus. The situation in Bioko is alarmingly close to being a catastrophe, with primate populations of international conservation significance being hunted to dangerously low numbers (Fa *et al.*, 2000). In 2002, Conservation Strategy Fund, UNGE, Arcadia University and Conservation International analysed the economics of wild meat on Bioko and found that around 20 percent of hunting income for around 120 families was derived from endangered primates (Reid *et al.*, 2005).

2.10. Opportunities

Opportunities include partnerships with training and research institutions. The reserve is considered a laboratory and key data source for students from universities around the world and in Equatorial Guinea (such as UNGE, Arcadia University, Drexel University, University of Alcalá, Politécnica de Madrid and Complutense University of Madrid).

Collaboration with other institutions such as National Geographic, Drill Films, BBPP and PTMB provide opportunities for research, communication and monitoring. The reserve has benefited from projects that developed research activities, conservation and protection of biological diversity and natural resources, as well as cultural and tourism aspects. The presence of multiple projects and potential partners opens the possibility of sustainable development for the neighbouring villages.

A proposal is being considered to nominate the Luba Reserve for inclusion on the UNESCO World Heritage List. The area is also of special importance for the Bubi culture and there is ample indigenous knowledge about the ecosystems and species. These are all opportunities to develop partnerships with national and international organizations for the better management of the reserve.

2.11. Partnerships

Over the last two decades, numerous players have signed partnerships with INDEFOR-AP in the Luba Reserve, more specifically in the field of research, monitoring and protection of endangered species. Major partnerships are as follows:

- Bioko Biodiversity Protection Programme has been one of the most prominent partners operating in the area for more than 20 years, with a mission to conserve Bioko's biodiversity. In 1998 the BBPP started its activities as an academic partnership between UNGE and Arcadia University. In 2007, the partnership moved to Drexel University.
- The PTMB conserves and protects sea turtles through the development and implementation of research, education and outreach programmes on Bioko Island. It also collaborates with stakeholders to strengthen local capacity and provide alternative occupations and income streams for the surrounding coastal communities, aiming to decrease the overall dependence of these communities on the reserve's resources.
- Drill Films is a wildlife documentary production company that has been operating on the island of Bioko since 2010, taking images of Equatorial Guinea flora and fauna for the production of documentaries.[2] Previous work focused on the megafauna of the reserve (such as primates and ungulates). Now, in collaboration with the BBC Natural History Unit, the focus is on

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[3] For more information please visit www.youtube.com/watch?v=C6lyCybUuWY

the ichthyofauna, especially fish species of southern Bioko.

- Central African Biodiversity Alliance is an international partnership of scientists, students and policymakers working to build a framework to conserve biodiversity in Central Africa.
- The State of Equatorial Guinea, through the Ministry of Forests and INDEFOR-AP, the Ministry of Tourism, and the Ministry of the Interior, provides funding, technical expertise and other support.

2.12. Innovation, recognition and outreach

Through the films made by Drill Films, the reserve has gained international visibility, and the various partnerships with international universities and organizations such as the BBPP and the PTMB have helped to raise its profile. It is hoped that validation of the management plan and its implementation will pave the way for greater recognition.

3. KEY LESSONS LEARNED

The main lessons learned from the management of the Luba Reserve are as follows:

- Involvement of external players has enabled and supported INDEFOR-AP to manage the reserve. It will be difficult to achieve sustainable management without technical and financial support from external partners.
- The results of many years of monitoring have provided critical data for the development of the new management plan, and years of collaboration with external organizations have led to the training of young Equatorial Guinean students and experts.
- Complacency about poaching has had an impact on wildlife resources. Restraining poaching activities and finding and promoting suitable alternatives to bushmeat consumption are essential for conserving the remaining primate populations in the area.
- Effective involvement and benefits for local communities are critical for overcoming poaching and livelihood pressures, and ensuring long-term sustainable development and conservation.
- Concerted action by all stakeholders is needed to capitalize on the available data and expertise, indigenous knowledge of the area and resources, the new management plan, partnership interests, and tourism and other sustainable development opportunities.

4. FUTURE OUTLOOK

The validation of the Luba Reserve's management plan and the establishment of new units – covering administration, finance, management, vigilance, research, ecological monitoring, ecodevelopment, ecotourism, training, awareness-raising, logistics and maintenance – is expected to strengthen sustainable forest management efforts. The involvement of external stakeholders, including universities, research centres and film producers, have increased the site's visibility, leading to a greater number of tourists. However, emphasis must be placed on law enforcement and optimal involvement of and benefit to local communities to ensure long-term conservation and sustainable management.

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CENTRAL AFRICA

ONGOING DECLINE AND CONFLICTS IN THE MAGARA-GASHIKANWA FOREST PLANTATION, BURUNDI

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NAME OF FOREST	**Magara-Gashikanwa forest plantation**
LOCATION	**Magara, Gatukuza, Gashikanwa, Ngozi, Burundi**
AREA (ha)	**60.8**
MANAGING ENTITY	**Gashikanwa Commune; Public Forestry Service**
MANAGEMENT OBJECTIVES	**Production of firewood and timber poles**
FOREST TYPE	**Forest plantation of *Eucalyptus grandis***

1. INTRODUCTION

The natural vegetation of Burundi has been extensively modified by human activities. The country's landscape comprises a mosaic of croplands, grasslands, wooded and open savannahs, small forest patches and human settlements. Gashikanwa Commune, within which the Magara-Gashikanwa forest plantation is located, has a forest cover of approximately 20 percent based on Google Forest Watch data.

The recent historical background of the Magara-Gashikanwa forest plantation starts after Rwandan refugees settled at the Magara site following the 1994 war. Refugee settlement was accompanied by the destruction of planted and natural forests in the area, which then needed to be replaced. After the refugees left in 1996, *Eucalyptus grandis* seedlings were produced and planted by trained locals with financial and technical support from the United Nations High Commissioner for Refugees (UNHCR), FAO, World Food Programme (WFP) and the Forestry Department (Royer, 2006; UNHCR and IUCN, 2005). Benefits from tree harvest (poles) were shared among the Gashikanwa Commune, the Forestry Department and the local communities under a tripartite partnership (Chamshama, 2011; Nduwimana *et al.*, 2023).

The partnership was initially commended as a pioneering example of participatory forest management in Burundi, highlighting the strong commitment of local people, especially women, to work together to manage a forest and share its revenues (Nyengayenge, 2003). This report describes the major changes and developments that have contributed to the deterioration of Magara-Gashikanwa forest plantation from 2002 to the present and considers its future prospects.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The Magara-Gashikanwa forest plantation was established in 1996 on public land, with management objectives defined through agreements among the involved parties, including local communities organized into associations, public forestry services and the communal administration. The original objectives were: (i) environmental protection and rehabilitation; (ii) production of firewood, poles and timber; and (iii) capacity building and improvement of the livelihoods of associated local communities. Today, only objective (ii) remains.

2.2. Type and condition of forest and scale of operation

From 2012, when the tripartite partnership collapsed, up to 2021, the Magara-Gashikanwa forest plantation area was openly accessible to anyone seeking wood for any purpose, without restriction. According to interviews conducted by the author with communal administration and the public forest service personnel, the illegal cutting of the forest stopped with the involvement of the Batwa association in 2021, and the state of the forest improved slightly. However, other respondents stated that unorganized and unplanned cuttings actually increased, both by former local community association members and the Batwa community itself. The forest plantation degenerated further, with the interior sections being the most affected. Even the least affected sections along the border are in poor condition.

2.3. Legal status and management structure

Both the legal status and the management structure of the plantation have changed over time, though the land itself remains public property. At the beginning, the Magara-Gashikanwa forest plantation was established as a tripartite partnership with financial and technical support from the UNHCR, FAO, WFP and the Forestry Department. The joint venture involved three key stakeholders: the Gashikanwa commune administration, responsible for administrative supervision; the forest services, tasked with technical supervision; and the local communities, organized in three associations for daily forest management.

The system collapsed in 2012 when the communal administration and the public forestry services ended the tripartite partnership on the basis that the three community associations had failed in their responsibilities to sustainably manage the forest. By 2021, the plantation had degenerated to the point (according to the administration) that the communal administration and the forestry

Poorly formed coppice shoots as a consequence of poor silvicultural practices

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Outer section of the forest plantation with degraded Eucalyptus grandis stands

services decided to transfer forest management responsibilities to a 40-member association in the neighbouring Batwa community. In exchange, the members of the association received food and agricultural inputs such as seeds and fertilizers.

2.4. Regulatory environment and government support

At the start, the tripartite partnership managing the Magara-Gashikanwa plantation was considered an exemplary approach for participative forest management in Burundi. Positive impacts of the project during the early stages included: reduction in thefts of standing trees, increased availability of fuelwood, improved management of the forest plantation, wide-scale involvement of women, the use of empty spaces to grow food crops and an increase in household income. It was even suggested that the approach be replicated, but this did not happen for the reasons outlined above. Hence, an early success transformed into a subsequent partial failure with the exclusion of the original local communities involved in plantation development.

The communal administration and the public forestry services stated that there was no reason to favour a limited number of members of the local population, among the many other households surrounding the plantation area, and that it had been discriminatory. However, former associations now consider themselves also discriminated against. By 2005, Burundi's political situation had changed, bringing in new leadership with no background knowledge of the Magara-Gashikanwa management system. This affected forest management and other areas of socioeconomic life as well, as described in the sections below.

2.5. Forest management practices

One of the tools that contributed to the early success of the Magara-Gashikanwa forest management was a reference management plan, established through the tripartite partnership. Such community-based forest management approaches have been tested elsewhere, with mixed results (Berkley, 1998; Pinkerton *et al.*, 2008; Dorji, 2011; Anep, 2017).

The plan was successfully applied until the collapse of the partnership in 2012. Regular planning meetings were organized monthly between the three partners (administration, forestry department services and association members) and three times each month among association members. Forest activities such as nursery preparation, scheduled pruning and harvesting (of poles), protection against fire, and issuance of cutting permits by the forest services were discussed during such gatherings. No replanting activities were undertaken throughout the years until today.

Since the cancellation of the tripartite partnership, the communal administration has been harvesting poles when needed for public construction without any forest management plan.

2.6. Production and business aspects

The main products from the plantations are poles and charcoal. The early tripartite agreement stipulated that 10 percent of the revenues obtained from the sale of forest products would go to the commune, 20 percent to the forestry department and 70 percent shared among the three associations with their total of 46 members. Up until 2012, the sale of poles and charcoal generated substantial income for association members. For example, a large pole (suitable for use as an electricity pole) could generate as much as Burundian franc 250 000 (about USD 85). The community members' share of the earnings provided them with sufficient income to cover urgent domestic needs.

Current wood production data from the Magara-Gashikanwa forest plantation was not made available to the author (OBPE Ngozi annual reports 2012–2019; Commune Gashikanwa annual reports, 1996–2019). Survey respondents indicated that poles illegally cut from the Magara-Gashikanwa forest plantation were sold in the nearby town of Ngozi for building construction. In the views of some respondents, such illegal harvesting decreased significantly with the recruitment of the Batwa association to oversee the forest.

2.7. Social aspects and impacts

The establishment of the Magara-Gashikanwa forest plantation relied on the labour of local communities, who were involved in all stages of the process, from raising seedlings in a nursery to harvesting. Besides receiving a percentage share of the harvested products, community association members – 30 percent of whom were women – had access to firewood and stakes for climbing beans sourced from the plantation. All members were trained in forestry techniques, including nursery establishment and pruning. Most of these individuals are now involved in seedling production for ongoing reforestation projects in the area surrounding Gashikanwa.

Local community livelihoods were affected by the 2012 changes in Magara-Gashikanwa forest management. The original three community associations lost their management rights and share of the products. The Batwa association is currently being remunerated only through agricultural inputs and food for work. All revenues generated from the plantation now belong to the government.

A Batwa association member stated that bringing the Batwa community into the co-management of the forest plantation improved community cohesion, organization, conflict management and empowerment. However, dissatisfaction arose among members of the other local communities and Batwa individuals who were not included in the association, as they also wanted to be part of the initiative and benefit from it.

2.8. Environmental values and impacts

After the forest plantation was established, small wildlife began to appear in the plantation, which interested the Batwa community, who are hunters by tradition. Spontaneous natural regeneration was also observed, indicating a shift towards a more stable, semi-natural forest ecosystem.

2.9. Challenges and threats

Many of the original group members have now passed away, and the new generation of local communities are less committed to responsible management of the forest plantation.

Furthermore, members of the Batwa and other local communities who are not involved in forest management or do not receive benefits from the forest (at least not through legal means) have felt progressively excluded. Rather than promoting social cohesion, the initiative has become a source of conflict. This sense of exclusion is further reducing community support and participation and threatens the future of the forest plantation.

2.10. Opportunities

The remaining fragments of the plantation are close to 30 years old and are seriously degraded. The Gashikanwa communal administration and the public forestry services plan to retain the Batwa community in the daily management of the plantation, and they welcome any financial support to revitalize the forest plantation.

The adoption of the *taungya*[1] system could be considered when replanting the forest plantation. This would allow farmers to grow short-term agricultural crops to generate revenues during the initial years of tree growth, before the trees form a closed canopy forest plantation.

2.11. Partnerships

As mentioned, the plantation was created and originally managed under the tripartite partnership involving the communal administration, the communal and provincial forest authorities, and local communities gathered into three associations. The UNHCR, FAO and WFP contributed technically and financially. There is now a new management partnership between the communal administration, forest services and the Batwa community.

2.12. Innovation, recognition and outreach

One of the benefits of the Magara-Gashikanwa initiative was capacity building and technical knowledge sharing. Most of the original association members were trained in forestry techniques, including nursery practices and silviculture (Besse and Vauron, 1990). One of them (Nzohabonimana Antoine) is a now a well-known nursery expert occasionally contracted by forestry projects.

3. KEY LESSONS LEARNED

In the early stages of the plantation venture, strong community organization, capacity building, management planning and implementation, and clear benefit-sharing arrangements helped generate economic benefits for both government agencies and local communities.

However, exclusion of certain communities or community members, along with the dismantling (rather than strengthening) of existing management structures, proved to be detrimental. To achieve long-term sustainability, it is critical to adopt a consistent and dynamic participatory approach that includes all stakeholders in the area.

4. FUTURE OUTLOOK

The Gashikanwa administration, together with the communal and provincial services, have a plan to rejuvenate and replant the forest with the same *E. grandis* species. However, they are critically short of funds needed to execute the plan.

Without new financial resources, the forest may be converted into agricultural land managed by government-supported farmer cooperatives. Approximately 0.5 ha in the heart of the forest has already been cleared for agricultural production, and a brickyard has recently been established within the plantation with administrative approval. If this widespread trend of agricultural conversion continues, it will likely lead to a shortage of fuelwood and an environmental crisis in the Gashikanwa area.

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[1] An agroforestry practice that integrates the cultivation of food crops with the establishment of tree plantations

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REGIONAL SYNTHESIS

LATIN AMERICA AND THE CARIBBEAN

César Sabogal, Forest Consultant

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BACKGROUND

Latin America and the Caribbean region possess 23 percent of the world's forests, totalling 940 million ha – 97.7 percent of which are naturally regenerated forests and 2.3 percent planted forests (FAO, 2020). These forests are managed for various objectives, including timber production, biodiversity conservation, and soil and water protection. They are predominantly owned by governments, individuals or companies, with significant portions designated for use by Indigenous Peoples and local communities (Alcorn, 2014). From 1990 to 2020, the region experienced a net loss of 138 million ha of forest, though the rate of loss decreased over time (FAO, 2020).

The region accounts for 13 percent of the global industrial wood market, and timber production is increasing through the expansion of fast-growing forest plantations (Blackman, 2021). Non-timber forest products (NTFPs) generate substantial revenue, but monitoring and documentation of NTFP use is limited (Blackman, 2021).

A significant portion of forests in the region are covered by long-term management plans (FAO, 2020). Community forest management is prominent in the region, covering extensive areas. Challenges for forests include ongoing deforestation primarily driven by agricultural expansion, climate change impacts, and economic uncertainties. Illegal logging also remains a concern in certain countries, constituting a substantial portion of timber harvesting in some regions (Alcorn, 2014).

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OVERVIEW OF THE SELECTED CASES

Thirteen cases were selected for the revisit: nine from South America and four from Central America, Mexico and the Caribbean (see **Table 1**, Introduction for summary of the cases revisited). All, but one are located in the tropics or subtropics, mostly in areas covered by humid broadleaf forests. Mapu Lahual in Chile is located in a temperate humid mixed forest, the Tezains case in dry coniferous forest in Mexico and the El Choloque case in the dry native broadleaf forest of Peru. The size of the forest management units ranges from a 90 000-ha concession in La Chonta, the Plurinational State of Bolivia, to a small, privately owned area of less than 1 000 ha in Colinas Bajas, the Dominican Republic.

In five of the nine cases,[4] the responsible management entity is a community or community organization, in three cases[5] an association of smallholders, and in one case[6] a private company. With the exception of Mapu Lahual, the communities manage land administered by the government (as protected areas or under concession), which is a common forest tenure arrangement in the region.

Seven of the nine cases deal with the management of natural forests, also reflecting the prevalent regional situation, although forest plantations of various sizes are becoming increasingly common. The main management objective in five cases is timber production, while in three cases NTFPs are the main focus. Forest conservation combined with compatible economic activities, such as ecotourism, the extraction of deadwood or NTFPs, and water services, is particularly important in two cases (Mapu Lahual and, more recently, Copén). Agroforestry, forest plantations and land restoration are important activities in the two cases involving more deforested or degraded areas (El Choloque and Colinas Bajas).

Overall, most of the cases fared well in maintaining a high standard of forest management. Cases that showed significant improvement in the economic, social and environmental outcomes are San Andrés, Tezains and Manoa. Comparatively, the cases of El Choloque, Colinas Bajas, Iratapuru and Mapu Lahual faced greater challenges in maintaining SFM. La Chonta and Copén have declined in many aspects and are no longer showing elements of good forest management. A challenging component for most of the cases appears to be business management and financial viability, followed by tenure and property rights. These two areas have also been identified in other studies as common challenges in the region (e.g. FAO, 2010; Nasi *et al.*, 2011, Sabogal *et al.*, 2013, Grulke *et al.*, 2016).

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[4] La Chonta, Plurinational State of Bolivia; Mapu Lahual, Chile; San Andrés, Guatemala; Tezains, Mexico; Iratapuru, Peru

[5] Colinas Bajas, Dominican Republic; Copén, Honduras; El Choloque, Peru

[6] Manoa, Brazil

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TRENDS AND KEY CHANGES

The following changes that occurred over the past two decades have been identified as having a significant impact on efforts to maintain forest management objectives and uphold high implementation standards.

INTENSIFYING DRIVERS OF DEFORESTATION AND FOREST DEGRADATION

The incidence of direct and indirect drivers of deforestation and forest degradation is a common challenge across almost all cases. The most directly affected cases are the La Chonta concession in the Plurinational State of Bolivia and the community forestry case in Copén, Honduras, both of which are severely threatened by land grabbing and agricultural expansion. Mining poses additional threat to La Chonta.

Agricultural expansion is also an issue around the Manoa company in the Brazilian Amazon and El Choloque in the dry forests of northern Peru.

Illegal activities, including drug trafficking, have also been affecting the La Chonta case and seem to be a risk in Tezains, Mexico.

Iratapuru, a community inside a major protected area in the Brazilian Amazon, was affected by the construction of a hydroelectric power plant, causing the relocation of families and bringing negative environmental and social changes to the community. In Mapu Lahual, the Mapuche-Williche communities are experiencing increased incidence of fires, firewood extraction and livestock activities, as well as a surge of external investments in large-scale tourism and mega-infrastructure projects.

CLIMATE CHANGE

Climate change appears to be a more recent degradation driver, affecting several cases: the San Andrés concession in Guatemala (risk of fires and decline in the productivity of valued NTFPs), Tezains (risk of fires and emergence of pests and diseases), El Choloque (phytosanitary problems affecting the population of high-value tree species) and Iratapuru (decline in the harvest of Brazil nuts).

EMERGENCE OF NEW DEMANDS AND MARKETS

New demand and favourable market conditions for forest products and services benefited forest management businesses in several cases, particularly those run by community organizations or associations. Examples include El Choloque, where the growth of beekeeping contributed to family income generation; Iratapuru, which accessed new markets for Brazil nuts and other NTFPs; and Mapu Lahual, which saw increased opportunities for ecotourism due to its scenic beauty and cultural value.

RESPONSES TO THE CHANGES

The changes experienced in the cases were addressed or confronted in different ways depending on the nature or severity of the change, the type of tenure, and the social, institutional, human and financial capital available. The key responses are highlighted below.

CONSOLIDATION OF GOVERNANCE AND ORGANIZATIONAL STRENGTHENING

Many of the cases made efforts to consolidate governance and strengthen organizational capacities, contributing to the continued achievement of forest management objectives and enhanced flow of benefits.

San Andrés consolidated the governance of the community bodies with experience and successful results in forest management, while Ejido Tezains continued to function well, evolving positively as a community process.

Communities in Mapu Lahual continued to advance a territorial management model enhancing the organization of local actors, fostering links with public services to improve the quality of life of local families, and balancing conservation with forest product development and diversification.

In Colinas Bajas, a motivated and committed community managed to successfully restore a completely deforested area to one with greater forest cover and thriving agroforestry systems. Similarly, the community in El Choloque remained committed to its values and objectives, successfully implementing land restoration, forest conservation and income-generating activities (honey production in particular), at the same time motivating and placing women and young people in important productive roles.

IMPROVED FOREST MANAGEMENT PRACTICES

Forest management activities and the consistent application of good practices were strengthened or improved in all but two of the cases.

Manoa company stopped outsourcing the extraction of wood and began to carry out the harvesting itself, resulting in improved quality of management operations, greater control, and cost reductions.

In San Andrés, the management organization maintained a periodic update, implementation and review of its forest management plan under an adaptive management approach.

The Ejido Tezains maintained efforts to prevent and control fires, manage pests, implement monitoring studies, and diversify forest production and income generation from tourism and carbon credits.

The loss of forest certification in Iratapuru did not change the way the cooperative managed the Brazil nut groves based on validated traditional SFM practices with due care for the health and safety of the collectors.

In Mapu Lahual, strengthened organizational capacities contributed to improved protection of the forest against burning and unsustainable harvesting, and enhanced economic opportunities with the production of alerce tiles, NTFPs and ecotourism, including a chain of associated products and services.

INCREASED CAPACITIES OF FOREST MANAGERS

Tezains improved capacities for processing forest products; the community forestry association in San Andrés acquired its own harvesting equipment and increased the number of species harvested; and the producers’ cooperative in Iratapuru improved its organizational and administrative management, resulting in enhanced income generation. In El

Choloque, the community association managing the forest demonstrated its leadership with responsible and transparent use of funding from public and international projects, benefiting local productive and conservation activities. The Mapu Lahual Indigenous Community Association showed leadership by strengthening the vision of the Mapuche-Williche communities and developing local projects and alliances.

REPLICATION OF GOOD PRACTICES

Demonstrated good practices have been replicated in some of the successful cases. For example, the community association in San Andrés is supporting the dissemination of its successful community forest management development process through courses given by community members with the support of educational and teaching organizations. The multiplier effect of these courses, as well as the many visits to the community concession, has contributed to the design and implementation of community-based forest management in several countries (e.g. Brazil, Colombia, Peru).

The reforestation and transformative model promoted in Colinas Bajas had a replication effect by attracting 25 small- and medium-scale forest companies to the area and reactivating the local economy based on the use of *Acacia mangium*.

PRODUCT DIVERSIFICATION AND VALUE ADDITION

Product diversification and value addition have been key to the development of successful forest management processes and the generation of employment and income (e.g. Copén and San Andrés). Viewing forest ecosystem management and conservation as opportunities to generate and strengthen sustainable value chains also contributed to the continued success of some of the revisited cases. For example, in Mapu Lahual, ecotourism development not only generated direct income but also opened up a chain of associated products and services that helped engage youth and women in decision-making roles at local and community levels.

FOREST CERTIFICATION

Forest certification has had a positive impact in maintaining a process of continuous review and improvement in various facets of production and forest management. In the case of Tezains, it also helped promote increasing the participation of women in production and decision-making processes. Although price premiums have not been realized, certification has demonstrated commitment to responsible forest management and also improved market access in some cases. In Iratapuru, forest certification helped professionalize the cooperative by providing knowledge and lessons in forest management techniques, as well as managerial and administrative practices. Forest management and chain of custody certification also facilitated Manoa's entry into the voluntary carbon market through its REDD+[7] project.

However, in two cases (Copén and Iratapuru), high costs and the effort involved in maintaining the certification standards resulted in termination of certification.

DECLINE IN FOREST PRODUCTION

The El Choloque community decided not to continue with the extraction of commercial timber to safeguard valuable forest species and to facilitate forest recovery, including biodiversity.

The community in Copén had to abandon the implementation of its forest management plan due to the misuse of the forest by settlers and illegal loggers, although conservation efforts around communal hydroelectric generation were maintained, providing some income to the community.

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[7] Reducing Emissions from Deforestation and forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks

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KEY CHALLENGES

As the contexts in each of the cases evolved, some of the changes threatened the very existence of the forest under management, while others required the development of new structures, skills, or technical, managerial and financial capacities to overcome or adapt forest management to the new realities. The key challenges identified are presented below.

UNFAVOURABLE POLICIES AND POLITICS

Almost all the revisited cases have had to confront increasing land-use pressure from agriculture expansion, infrastructure and other development projects. There seems to be low interest and commitment from national governments to support SFM in general. This might be associated with macroeconomics favouring more “lucrative” economic activities, combined with misconceptions and lack of information on the potential flow of benefits from well-managed forests. The influence of lobbies from the agricultural, environmental, mining, energy, construction and transportation sectors on national and subnational governments is well known in the Amazon and other parts of the region. Most of the reviewed cases show the impact or increased influence of these pressures.

The poor performance of public institutions in some of the cases reflects a lack of political interest in, or demonstrated opposition to, forest production activities, thus creating an unfavourable environment for SFM.

In La Chonta, critical social and political changes at country level favoured rather short-term exploitative activities in forest areas. The new administration of La Chonta, an umbrella organization of local communities, did not demonstrate a clear vision or commitment to SFM. The forest management plan was abandoned and no silvicultural measures were applied, leaving harvested areas unprotected after commercial logging. The decline of high-value hardwood species was compensated for by harvesting lower-value species, thus contributing to further degradation of the forest.

In El Choloque, the regional government’s inaction to protect conservation areas, control the impact of agro-industries and promote environmental projects poses severe threats to the remaining dry forests and ecosystem services provided by these forests.

In Colinas Bajas, authorities’ lack of interest in promoting policies that encourage commercial use of forests was noted, in combination with the opposition of the environmental sector to forestry activities.

INSTITUTIONAL AND ADMINISTRATIVE CHALLENGES

The forestry sector tends to be overburdened by bureaucratic and sometimes unrealistic regulations and cumbersome administrative procedures that cause considerable delays and transaction costs. The excessive control of forest management units by authorities is a cause of recurrent complaint, making forest management difficult to maintain and even prompting the closure of local processing facilities in some cases. The lack of effective response by authorities against illegal activities has also been highlighted.

Tenure issues resulting in insecure communal or family rights (as in Iratapuru and Mapu Lahual) can weaken or restrict land and forest management activities. However, it has also been observed that assigning forest use tenure to indigenous communities does not automatically guarantee SFM (as in the case of La Chonta).

SOCIAL AND GOVERNANCE ISSUES

Social conflicts caused by outsiders (e.g. settlers, illegal loggers, miners, drug mafias) who invade forest management units and change land use are much more present today than 20 years ago and are perhaps the most serious direct threat facing forest managers, as evidenced in La Chonta and Copén.

As seen in those cases, there is poor governance and lack of law enforcement by public authorities, either due to lack of means (e.g. personnel, transport, fuel) to adequately respond or because they are themselves involved in the illegal activities or are acting under directives from higher hierarchical levels. Poor coordination among government authorities at different levels is also a source of frustration.

MANAGERIAL, TECHNICAL AND ECONOMIC CHALLENGES

Managerial issues still represent a significant challenge for community-based managing entities and particularly for value-added business development. This is experienced not only by relatively less-consolidated organizations (such as in Iratapuru and Mapu Lahual), but also by more developed organizations (such as San Andrés and Ejido Tezains). In Colinas Bajas, the local association declined because of poor financial management and lack of controls in its operations.

Another issue, also involving communities, relates to insufficient allocation of profits for reinvestment in forest management.

Establishing market access and responding to changes in market preferences also require appropriate technical and financial skills as described for El Choloque, Iratapuru and Mapu Lahual.

INFORMATION AND COMMUNICATION ISSUES

Inadequate access to relevant information and knowledge to support forest management decision-making continues to be an ongoing challenge, particularly for communities. This includes information and knowledge on regulatory aspects of forest management, business development, the potential use of new forest species, value-added product development, marketing, and access to carbon markets, among others.

Poor communication also continues to be a challenge that restricts not only the acceptance of SFM but also opportunities to reach out to other relevant sectors of society. The need for more proactive engagement of managing entities and collaborators in awareness-raising campaigns and well-articulated lobbies has been identified in most of the cases revisited.

ENVIRONMENTAL CHALLENGES

Climate change is increasingly perceived as a threat to forest management and the maintenance of various forest benefits. It is being implicated in more frequent fires, appearance of pests and diseases affecting commercial timber species, and reduced productivity of some NTFPs (e.g. Brazil nuts). Natural disasters and extreme weather events also impact the infrastructure needed for forestry operations and product transport.

ENABLING CONDITIONS

In pursuing SFM under evolving contexts, demands and challenges, each case has gained valuable experience and insights from what has worked and what has not worked. From these experiences, numerous enabling conditions or success factors contributing to SFM have been identified. They are presented below.

A WELL-FUNCTIONING MANAGING ENTITY:

- a business vision and policies that prioritize forest sustainability, management quality and social commitment, and that are appropriated from the outset by the employees themselves (Manoa);
- efficient administration, motivating associates in the management of the concession and fostering a positive attitude towards forest conservation (San Andrés);
- clear vision and business policies, commitment to sustainability and the generation of social and economic benefits (Manoa);
- strong community organization, high awareness of duties and rights, and good functioning of its assembly (Tezains); and
- improved administration capable of generating income for members (Iratapuru).

FUNCTIONAL GOVERNANCE STRUCTURE, STRONG LEADERSHIP AND ORGANIZATIONAL CAPACITY:

- a minimum of governance that guarantees control of the agricultural frontier or illegal activities, in order to conserve and manage forests (La Chonta, Copén);
- good social governance with leadership continuity to ensure success of the forest management process (San Andrés);
- the organization of grassroots actors who aid in the proper development of the forest production process (Copén);
- a distinctive governance structure at the community level with established rules of use and intrinsic customs to manage conflicts (El Choloque);
- strong local organizations that integrate the elderly and young people (Colinas Bajas); and
- the active involvement of women and local leadership under an intergenerational approach (Mapu Lahual).

TECHNICAL CAPACITIES FOR FOREST MANAGEMENT AND BUSINESS DEVELOPMENT:

- efficient and well-implemented planning and monitoring of forest management operations and their impacts (Manoa);
- capacity for planning, managing and monitoring the forest concession (San Andrés);
- organizational capacity to maintain solid production over the years, while improving administrative processes and industrial capabilities (Tezains);
- capacity-development to develop community forest management (El Choloque) and create a generation of extractivists concerned with the community's environment and forest conservation (Iratapuru); and
- farmer-to-farmer training and internships to build capacities for production, management and community leadership (Colinas Bajas).

GENERATION AND RESPONSIBLE DISTRIBUTION OF ECONOMIC AND SOCIAL BENEFITS:

- established proportions for distribution of dividends to support community infrastructure and families in need (Tezains);
- reinvestment of profits from timber sales in social works and in strengthening communities' livelihoods (Colinas Bajas);

- benefits accrued from value-added processing of Brazil nuts in their own agroindustry (Iratapuru);
- generation and equitable distribution of benefits (Mapu Lahual); and
- income from water services provided by the forest for the generation of hydropower (Copén).

SECURITY OF FOREST USE RIGHTS:

- secure forest use rights, as a minimum.

MAINTAINING GOOD RELATIONSHIPS AND EFFECTIVE PARTNERSHIPS:

- good relations with communities, authorities, clients, academia, researchers, educators and organized civil society in general (Manoa, San Andrés, Iratapuru, Colinas Bajas);
- support of NGOs for the marketing and commercialization of forest products to achieve profits to invest in social development (Copén); and
- good participation and local leadership to help attract new actors and generate new alliances (Mapu Lahual).

GOVERNMENT SUPPORT:

- government support for forest management through a respectful and technically oriented relationship with supervisory entities and the community, fostering a conducive environment for sustainable forestry (Tezains);
- the support of public institutions to strengthen organizational management and territorial governance, thus resulting in important socioeconomic and cultural benefits for the community (Iratapuru);
- support from national and subnational governments in improving the productive capacities and overall well-being of local communities (Mapu Lahual); and
- steadfast support of national and local authorities for community-based forest management (San Andrés).

INNOVATIVE TECHNICAL, MANAGERIAL AND FINANCIAL APPROACHES:

- innovative managerial and technical approaches to forest management (Manoa);
- beekeeping and honey production, which can transform the forest into an “economic asset” of interest to community members (El Choloque);
- creation of a fund, allowing investments in renovations and acquisition of machinery and buildings for processing, and support for local projects (Iratapuru); and
- development of production and marketing models for products destined for local, regional and national markets (Mapu Lahual).

INCORPORATION OF FOREST MANAGEMENT PRACTICES INTO THE CULTURE, ECONOMY AND LIVELIHOOD STRATEGIES OF THE COMMUNITIES:

- incorporation of forest management practices and the processing and marketing of forest products into the local economy and livelihood strategies, enabling the rooting of a forestry culture as a fundamental bastion of forest conservation (Tezains);
- preservation of traditional practices in Brazil nut collection, helping to mitigate the impacts of hydroelectric power plant development and climate change (Iratapuru);
- engagement of the local population in forest resource management as an effective approach to the conservation of forests and their biodiversity (San Andrés); and
- local recognition of the value of forest ecosystem services contributing to an optimal balance between production and conservation (Mapu Lahual).

FUTURE DIRECTIONS

The future scenario for SFM in the region is understandably context-specific and unpredictable because of the complexity of factors and their interplay. The findings and insights from the revisited cases provide a number of considerations that may guide or shape the future of SFM. They are presented below.

CONVERSION OF FORESTS TO AGRICULTURE AND OTHER NON-FOREST ACTIVITIES

This is by far the most serious current and future threat for forests and forestry in the region regardless of the type of tenure or management. The lack of effective government response to counter land grabbing and other illegal activities in many forested areas paints a gloomy picture for the fate of SFM.

DEMAND FOR LEGALLY SOURCED WOOD, INCLUDING FROM NEW TIMBER SPECIES

The demand for legal wood products from natural forests is expected to increase in the national markets as a result of measures against illegal timber extraction and the expected growth in wood use in some sectors (e.g. construction). Well-established and operating forest management units can expect to benefit from a growing market for industrial wood as well as for quality tropical timber.

RESOURCE USE DIVERSIFICATION WITH GREATER EMPHASIS ON NON-TIMBER FOREST PRODUCTS AND VALUE ADDITION

Product diversification and value addition are key to ensuring the continuity of forestry operations. This seems to be not only a logical but a necessary step to respond to changing consumer needs and preferences.

IMPROVED ECONOMIC PROSPECTS FOR SUSTAINABLE FOREST MANAGEMENT THROUGH THE CREATION OF INCOME FROM ECOSYSTEM SERVICES

Forest managers expect more opportunities to generate income flows from environmental services linked to carbon sales, water provision, biodiversity conservation and ecotourism development. These opportunities are already being pursued in some cases and could be expanded to other initiatives that demonstrate strong governance and a commitment to conserving their forests and landscapes.

INCREASED CAPACITIES FOR COMMUNITY-BASED BUSINESS DEVELOPMENT

The evolution of the community-based forestry cases has demonstrated the need for adjustments to their management processes, especially in developing business activities. In the future, more community-based forest business managers may be trained and equipped to improve internal governance and management mechanisms, as well as to generate and strengthen sustainable forestry value chains.

NEW ALLIANCES AND COLLABORATIVE ARRANGEMENTS

Transitioning towards value-added production and multiple-use forestry, particularly for community-managed forests, creates the need to forge alliances and collaborative arrangements with public and private entities at various levels. This is a key to sustainably manage natural resources and introduce productive innovations.

EFFECTS OF CLIMATE CHANGE

Climate change will likely pose a significant disruption to SFM by exacerbating water scarcity, increasing the risk of forest fires, triggering plant diseases and in general affecting ecosystem functioning, potentially leading to social conflicts. More integrated forest management approaches are needed to address climate change-related risks in forest management, as well as to invest in innovations and research.

ENHANCED COMMUNICATION AND OUTREACH

Forest managers are increasingly recognizing the need to act more proactively and convincingly to communicate the multiple values and benefits of SFM to decision makers and society as a whole. This calls for more coordinated awareness-raising and advocacy campaigns as well as educational activities involving government bodies, community organizations, the private sector, development partners, academia and research institutions.

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LATIN AMERICA AND THE CARIBBEAN

COPÉN: ALONE IN THE BATTLE

Fernando Carrera and **Roger Villalobos**, CATIE

NAME OF FOREST	Brisas de Copén
LOCATION	Municipality of Iriona, Department of Colón, Honduras
AREA (ha)	4 284
MANAGING ENTITY	Collective society of local residents (*Sociedad Colectiva Roberto Barahona y Asociados*, now *Cooperativa Agroforestal Limitada*)
MANAGEMENT OBJECTIVES	Industrial wood production; forest protection; community forest management
FOREST TYPE	Subtropical humid, native broadleaf forest

1. INTRODUCTION

This case is one of the most emblematic in Honduras. It began with the organization of a collective society of residents of the territory, who later established an agroforestry cooperative, promoted at that time by the Honduran Forestry Development Corporation, today the Forest Conservation Institute.[1] The initial management was supported by the Madera Verde Foundation under an Annual Forestry and Operational Management Plan. This plan directed the harvesting, primary processing and timber extraction, utilizing mules and river transport to deliver materials to the community of Copén, with mahogany (*Swietenia macrophylla*) as the primary species harvested. The block wood then went through a re-sawing process with a portable sawmill before subsequent export to the United States, where it was supplied to companies such as Taylor Guitar, Brian, Allied and producers of high-priced products such as guitar necks and furniture. Profits were reinvested in the social development of the community.

The process was well valued and even achieved FSC certification. However, the forest and forest management practices later deteriorated because of continuous invasions by land speculators who, with complete impunity, cut down the forest despite the cooperative's usufruct contract. There was land grabbing and expansion of the agricultural frontier by drug traffickers. The forest was also subject to illegal extraction, which destroyed the productive forest and rendered management unfeasible. The state showed complete indifference, failing to prevent the illegal activities despite numerous complaints.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The management objective was to sustainably produce mahogany wood for use as guitar necks and furniture pieces to be exported to the United States of America. The exploitation of other timber species was not economically viable because of the high extraction costs and lack of market demand. Resources were managed and used for the social benefit of the community following a community forestry strategy.

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[1] For more information please visit https://icf.gob.hn/

2.2. Type and condition of forest and scale of operation

A multi-temporal analysis revealed that the area managed by the cooperative was effectively protected during its active operational period, in contrast to the widespread deforestation occurring in regions outside its management. The area resembled an island where effective forest management successfully curtailed deforestation. Little by little, however, pressure from invaders increased, and they entered the managed forest, despite repeated complaints from the cooperative to the state. According to the Forest Conservation Institute (2020), the forest area allocated to the cooperative shrank from 3 884 ha in 2014 to 3 408 ha in 2019, as a result of the land use change from illegal encroachment. Members of the cooperative became discouraged and finally stopped taking action to try to resolve the situation.

2.3. Legal status and management structure

The first management contract was for five years. It was later extended to 30 years after good initial performance. Now there is a risk of its cancellation by the state in response to increasing deforestation and the absence of forest management activities. This situation has led to discouragement among the cooperative members, who feel their efforts are not being recognized or rewarded. Some argue that while the invaders are hoarding land, cooperative members – who adhere to the law – are left empty-handed.

Although the forest management plan has expired, the organizational structure remains intact, enabling the cooperative to be legally established and continue its activities.

2.4. Regulatory environment and government support

Initially, the cooperative had FSC certification but later decided to do without it because of its high costs and stringent certification standards, which were difficult to maintain given low production volume. Additionally, the buyers of the lumber did not require certification.

Mostly deforested landscape around the community of Copén

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Wood sawing using a framed chainsaw

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Transport of harvested timber by mules

The state's support was limited to signing the usufruct contract, which authorized the cooperative to manage the forest. It did not provide administrative support or technical assistance for forest management. Furthermore, bureaucratic delays resulted in wait times of up to two years to approve a plan of forestry exploitation. Worse still, there was no attention to the cooperative's complaints regarding forest encroachment.

The members of the cooperative defined a community forestry strategy that determined the way in which the financial resources of the cooperative would be managed. Fifty percent of the profits would be distributed as dividends among partners, 30 percent would be allocated to community investment and 20 percent would be used for productive projects (ICF, 2013).

2.5. Forest management practices

At the beginning, wood was sawn with a handsaw, since, according to state instructions, chainsaws were prohibited. After a change in legislation, wood was sawn using freehand chainsaws and later framed chainsaws. Wood was transported by river and using mules until it reached the town centre, where it was re-sawn in the portable sawmill.

In addition to the wood authorized under the annual operational plans, the community implemented salvage plans for the use of wood felled by natural phenomena. Overall, harvesting was conducted on a small scale, involving 12 to 20 trees per year, with a cutting cycle of 30 years. Harvesting followed low-impact techniques regulated by the ICF and supported by the regulations for broadleaf forest management and Honduran forest law.

Given the use of reduced-impact harvesting techniques, which generated sufficient but not excessive gaps to support natural regeneration, the Madera Verde organization concluded that enrichment planting and post-harvest silvicultural treatments were unnecessary.

Due to insecurity and deforestation caused by illegal invaders, forest management has been suspended.

2.6. Production and business aspects

At first, the wood was taken in pieces or blocks by river and sold with minimal added value, resulting in low profits for the community. Later, focus shifted to producing squared mahogany wood for the export market, supplying the companies such

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Sawn timber being transported by river

as Gibson and Taylor, which paid higher prices because they had corporate social responsibility commitments.

The processes of exporting wood – sized and classified by quality – were supported by Green Wood in the United States and the Madera Verde Foundation in Honduras. The role of these two organizations was to act as intermediaries in favour of the community, helping to identify markets and providing technical, administrative and legal assistance to the organized groups.

With the support of a loan, a Wood-Mizer portable sawmill was purchased, which improved product quality and led to better prices – ranging from USD 8 to 20 per board foot in the export market. However, following the decline of cooperative forest operations, the sawmill was sold to another agroforestry cooperative.

The greatest impact of the community forest management was the generation of employment, which benefited multiple families directly and indirectly. Of the reported income, 70 percent was attributed to costs and 30 percent to profits, with most of the costs being payment of labour for production (Rosa, 2022).

2.7. Social aspects and impacts

The community forestry strategy proposes reinvesting profits in social projects such as education, access to drinking water and job creation, thereby improving livelihoods and strengthening the community. The cooperative is rooted in the strong cultural identity of its members, who value the forest and seek to conserve it. The organization has received and carried out several awareness campaigns in coordination with and with support from local authorities such as the ICF and the Madera Verde Foundation. Despite the advance of deforestation by illegal groups, the forest area assigned to the cooperative still serves as a core of conservation amid a sea of destruction.

The community has a skilled workforce for forestry production processes, but given the suspension of forestry activities, alternative activities have drawn labour, including artisanal gold extraction, livestock farming and other commercial ventures. Effective organization also enabled other activities beyond forest management, including the generation of electrical energy through microturbines, which necessitated forest conservation to protect water sources.

2.8. Environmental values and impacts

While forest management activities were being carried out, the forest remained in good condition. Now the situation has changed as a result of encroachment by outsiders. A part of the forested area that captures water for hydropower generation remains well preserved because the community prevents activities that could negatively impact the watershed.

In addition to logging, illegal gold mining has contributed to the deterioration of the forest. The extraction process involves the use of mercury, which contaminates water sources. Deforestation for livestock farming has also reduced natural habitats for local fauna, leading to increased human–wildlife conflict. Residents have shown their concern over these events and have called on regulatory authorities to develop strategies or mechanisms to reduce wildlife attacks on livestock.

2.9. Challenges and threats

The main problem is land grabbing by drug traffickers, a practice known as "narco-livestock farming." There is poor governance in the area, with the state not being involved in the management of the cooperatives.

Municipal governments display a degree of indifference because it is economically advantageous for them in the short term to have land registered for agricultural use, which generates revenue. In contrast, forest conservation does not.

Another threat is the presence of illegal timber markets, which makes long-term management difficult. It is difficult to compete with illegal exploitation under current regulations.

The most pressing concerns are legal insecurity and the loss of forest cover, both of which pose a threat to the management contract held by the cooperative. State evaluation will show indicators of poor management and misuse of the forest management areas, even though these issues stem from factors outside the control of the cooperative.

2.10. Opportunities

Opportunities include the global interest in landscape restoration through international cooperation. However, such activity requires halting the rampant deforestation. As long as the state does not take control, little can be done in the territory, which has been transformed into a landscape dominated by cattle ranches and "narco-highways."

Although Copén is no longer an exemplary forest management case for timber production, it still demonstrates effective forest conservation for water services. The community remains organized around this objective and continues to benefit from it.

Deforestation for livestock farming

©JOSE ROSA/FMV

The cooperative, with state support and international cooperation, could reactivate its forest management operations and revitalize the local economy. This could be achieved through commercial species other than mahogany and value-added processing. The availability of mahogany is limited now due to illegal exploitation by third parties.

2.11. Partnerships

The partnership evolved from a collective society to an agroforestry cooperative limited. In practice, it continues to be organized but without full confirmation of its legal status. Because of the present difficulties in managing the forest, the cooperative has not updated its legality procedures. Its statutes are obsolete, and it has pending procedures to be reviewed by entities such as the National Supervisory Council of Cooperatives and the Honduran Federation of Agroforestry Cooperatives.

2.12. Innovation, recognition and outreach

Copén is no longer an exemplary case of sustainable forest management, but it is a model of organization and use of water resources for energy production. This has enabled the cooperative to enjoy the comforts that electric energy provides. In 2009, it was recognized by FAO as one of 22 exemplary cases in Latin America for good management of resources by local communities (de Jong *et al*., 2010).

3. KEY LESSONS LEARNED

- A minimum of security is needed, and the state needs to guarantee the rights of the cooperative.
- Value addition is key to the successful development of the forest management process.
- The support of an NGO (Madera Verde) for the marketing and commercialization of production helps to achieve profits that can be invested in social development.
- The organization of grassroots actors is essential for the proper development of the forest production process.
- Participation and incentives by state institutions are key to ensuring the proper functioning of cooperatives. This can be enhanced through initiatives that create enabling conditions and facilities for cooperatives to carry out their forest administrative and management activities.

4. FUTURE OUTLOOK

The invasion and degradation of productive forest by outsiders with total impunity will inevitably lead to the disintegration of the cooperative.

As long as the state does not take real action or provide support, it will remain challenging for the cooperatives to continue sustainable forest management and undertake productive commercial activities.

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LATIN AMERICA AND THE CARIBBEAN

COMMUNITY PROTECTION AND SUSTAINABLE USE OF THE EL CHOLOQUE DRY FOREST

César Sabogal, Forest Consultant, and **Patricia Medina**, Independent Consultant

NAME OF FOREST	El Choloque, Comunidad Campesina en Lambayeque
LOCATION	Motupe District, Lambayeque Province, Peru
AREA (ha)	1 027
MANAGING ENTITY	Association for the Protection of the Dry Forests of Caserío El Choloque (under the supervision of the local administration of *caserío* El Choloque)
MANAGEMENT OBJECTIVES	Production of non-timber forest products; collection of firewood and deadwood for local consumption; beekeeping; agroforestry
FOREST TYPE	Tropical dry forest (native broadleaf forest)

1. INTRODUCTION

El Choloque forest (**Figure 1**) is one of the northernmost remnants of the equatorial dry forest – also known as the endemism region of Tumbes – one of the most important yet threatened places on the planet in terms of biological richness. The area has been subjected to intensive and selective harvesting of timber, mainly of *algarrobo* (*Prosopis pallida*), *palo santo* (*Bursera graveolens*) and *hualtaco* (*Loxopterygium huasango*), whose wood has been used as a source of energy (charcoal and firewood).

The campesino community of Tongorrape, of which El Choloque is a part, has been conserving the forest on its own initiative, with the participation of many of the approximately 60 families that make it up. In 2002, they formed the Association for the Protection of the Dry Forests of Caserío El Choloque (ASPROBOS) and work under the supervision of the local administration of the *caserío* (or village) El Choloque. Determined to seek activities that would reduce forest pressure and generate new income, the association obtained international cooperation funds that year to develop organic beekeeping and the production and processing of fruits for sale as jams, jellies and preserves in syrup, the latter activity carried out by women (Díaz de Cerio, 2010).

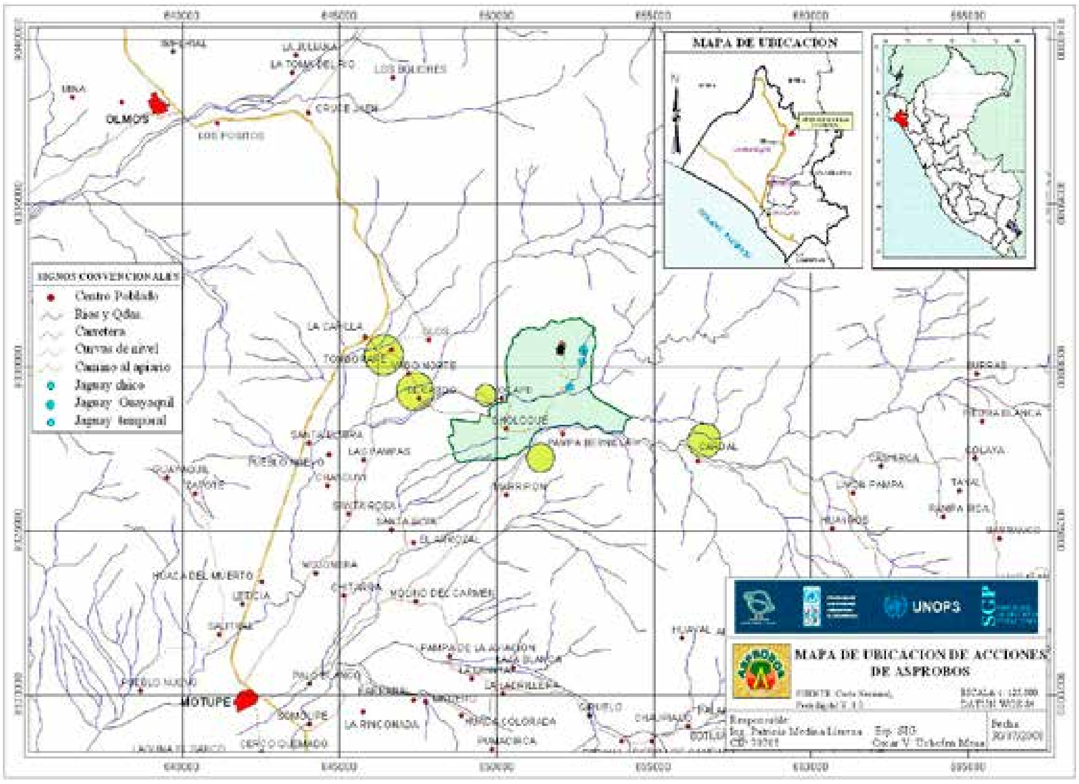
An FAO publication (Pelayo *et al*., 2010) highlighted the following as outstanding elements of the El Choloque case: (i) the level of community organization, with formal procedures for decision-making; (ii) the execution of community activities and communication; and (iii) the formation of its own executive structure, ASPROBOS, which has enabled the community to develop initiatives of common interest and have representation before external agents.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The community forest management plan (FMP) was elaborated in 2004 with the participation of forestry professionals, local authorities and community

Figure 1. *Location of El Choloque forest, Lambayeque, Peru*


MAPA DE UBICACION
SIGNOS CONVENCIONALES
● Centro Poblado
Rios y Qdas.
Carretera
Curvas de nivel
Camino al apiario
● Jaguay chico
● Jaguay Guayaquil
● Jaguay temporal
OLMOS
LOS POSITOS
LA JULIANA
LA TOMA DEL RIO
LOS BOLICHES
CRUCE JAEN
LA CAPILLA
TORBORAZE
CHOLOQUE
PAMPA DE PINCHE
CARDAL
SANTA ISIDRA
LAS PAMPAS
PUEBLO NUEVO
GUAYAQUIL
CHANCUY
SANTA ROSA
SANTA ROSA
EL ARROZAL
PARRIPON
CAMARCA
LIMON PAMPA
HUARRES
COLAYA
PIEDRA BLANCA
SURGAS
HUACA DEL MUERTO
LETICIA
MOLINO DEL CARMEN
PAMPA DE LA AVIACION
LAJA BLANCA
LA CHILLERA
PUEBLO NUEVO
MOTUPE
SONDUPE
LA RINCONADA
PIEDRA COLORADA
PUMACHICA
CERRO QUEMADO
LAGUNA EL PALMO
UNOPS
MAPA DE UBICACION DE ACCIONES DE ASPROBOS

Source: ASPROBOS. n.d. Internal document

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

members. The management objectives remain the same, other than that they no longer include the use of timber for commercial purposes. This was a community decision taken the same year to safeguard valuable forest species and restore the forest and its biodiversity. Therefore, the objectives of forest management became the use of non-timber forest products, collection of firewood and dead sticks for self-consumption, beekeeping with native bees, and agroforestry practices on privately owned lands.

2.2. Type and condition of forest and scale of operation

The forest area included in the FMP (ASPROBOS, 2004) initially comprised 634 ha, but in 2008 it increased to 1 027 ha when a neighbouring sector was included (El Cardo, today *caserío* Soledad). The area comprises dry plain forest and hill forest.

For more than a decade, various types of diseases have been affecting the tree population (Yachi, 2018). An evaluation in the *algarrobo* forests (MINAM, 2019) revealed that 95 percent of all the trees showed infection in different degrees, with young trees being the most affected. Biological causes include fungi, insects and a possible *Closteroviridae* virus (Llontop, 2010). Added to this was the excessive exploitation of the aquifer and climatic variations that weaken *algarrobo* trees.

2.3. Legal status and management structure

There have been no changes in the legal situation of El Choloque. The community members have customary rights over the forests and possession of the agricultural lands. Forest use is carried out on communal lands that cover 487 ha (Yachi, 2018).

Forest management is the responsibility of ASPROBOS, through its board of directors made up of five members who change every two years.

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View of El Choloque forest

2.4. Regulatory environment and government support

The regional political and economic scenario has taken a turn in the last decade to favour the expansion of agricultural export crops, partly at the expense of forests. In the case of the department (region) of Lambayeque, about 4 000 to 7 000 ha of forests are converted or illegally felled annually to produce charcoal and firewood from *algarrobo* trees for restaurants in large cities.

In November 2019, the Regional Table for Forest and Wildlife Control and Surveillance of the Lambayeque Region[1] was established to coordinate the protection and conservation of the natural ecosystems of Lambayeque. However, the gaps in logistical and personal support for the institution do not enable adequate action and make it difficult for the competent authorities to disseminate regulations and monitor their compliance.

A report by the Agency for the Supervision of Forest Resources and Wildlife detected a high proportion of forest management plans with false information (OSINFOR, 2018). Currently, there are only two active FMPs in Lambayeque, including that of El Choloque, because the current guidelines (SERFOR, 2021) only allow harvesting in dense forests with more than 150 trees/ha, which hardly exists anymore in the region.

The situation of the natural protected areas in Lambayeque is worrisome. For instance, categorization of regionally administered protected areas, such as the Bosque Moyán Palacio Regional Conservation Area (ACR) and the Huacrupe-La Calera ACR, helped to protect them from invasion and conversion into agricultural areas in the past decade. However, their conservation and protection have not met expectations as a result of the low budget and lack of personnel.

The technical forestry and wildlife administration of the National Forestry and Wildlife Service (SERFOR) in Lambayeque is prioritizing the rebuilding of ecological connectivity,[2] uniting the protected areas through the creation of a corridor to protect critical habitats.

According to the director of the Regional Authority of Natural Resources and Environmental Management, the current regional government offers a favourable situation for the management of natural resources, supported by the governor's concern for climate change, environmental quality, restoration and reforestation.

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[1] For more information please visit www.jica.go.jp/Resource/project/spanish/peru/006/news/general/181127.html

[2] Based on the "Zoning for the selection of priority areas for the conservation of Tumbes and Lambayeque", a study carried out by the Data Center for Conservation

2.5. Forest management practices

The forest of El Choloque suffered intensive and selective exploitation for decades, followed by a period in the recent two decades during which the inhabitants prioritized its recovery through protection and surveillance, and practised empirical management practices. The FMP divides the forest areas into four use categories (see **Table 1**).

In the FMP, a 20-year harvesting cycle was foreseen both for direct use of wood through pruning or thinning, as well as for the use of non-wood forest products such as fruits, leaves and other forest by-products. Three main species are used for wood: *hualtaco* (*Loxopterygium huasango*) for utilitarian handicrafts and ornaments; *palo santo* (*Bursera graveolens*) residues and dry or diseased branches for incense and firewood for self-consumption; and overo (*Cordia lutea*) for poles for propping up passion fruit vines and mango trees. The planned minor use of the forest resources included for livestock (for meat and milk), beekeeping (for honey, pollen and other bee-related products), *algarrobo* (for carob and carob bread), *palo santo* (resin for medicinal balms), *charán* (for dyes and natural tannins) and fruits (pectin for jams). Currently, the use of wood is restricted to meeting domestic needs for construction, poles to support fruit trees, and firewood. This requires obtaining a permit from the local administration board in the sector assembly, which is a straightforward process.

The silvicultural plan includes (i) the protection of natural regeneration, especially for those trees prone to being damaged by cattle; (ii) the identification and protection of trees to ensure maintenance of genetic resources and seed production; (iii) enrichment planting to increase tree cover and floristic diversity; and (iv) pruning and thinning of trees and shrubs to stimulate growth and the development of straight stems.

The FMP includes three complementary programmes: (i) strengthening of local capacities for community forest management; (ii) training of forestry promoters; and (iii) establishment of a control and surveillance system. The natural regeneration of valuable forest tree species is protected through agreements with community members to limit livestock grazing in the forest, although with the years of intense drought and

Table 1. *Zoning and productive characteristics of the areas according to the forest management plan for El Choloque*

DESIGNATION	AREA (ha)	ZONE	OBJECTIVE
Production forest	192	Hualtacal	Short wood for handicrafts through pruning and thinning
	60	Overal	Poles for handicrafts and local use Fodder production
Forest for future use	95	Lomas Dianas	Fodder production Nectar and pollen production for beekeeping Production of firewood (by pruning) for self-consumption
	110	Lomas Facundas	Fodder production Nectar and pollen production for beekeeping Production of firewood (by pruning) for self-consumption
Protection forest	20	Charanal	Strict protection of *charán* (*Caesalpinia paipai*) Fodder production
Cultivation areas and pastures	(Not determined)	Family parcels	Production of firewood and charcoal for self-consumption Agricultural production through an ecological approach

Source: ASPROBOS. 2004. Plan de Manejo Forestal Comunitario para los Bosques de El Choloque. Proyecto “Promotores campesinos y comuneros participan en el Manejo Integral del Bosque Seco en el Sector El Cardo – Tongorrape”. Peru.

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A **hualtaco** *stand that regenerated naturally after El Niño in 1983 and 1998*

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Palo santo *tree in the forest*

the decline of algarrobo trees, the use of livestock has been greatly reduced. In addition, ASPROBOS associates carry out monitoring and surveillance of the forest.

As per the FMP, permanent forest areas were established to deter forest conversion. This vision was expanded at the basin level with the creation of the Moyán Palacio ACR, which provides the water ecosystem service for El Choloque. In recent years, ASPROBOS has applied a landscape approach that promotes small-scale fruit tree farming with technical irrigation and organic certification in El Choloque and its neighbours. Fruit production for export began in 2018 and has currently reached 1 200 tonnes/year.[3]

2.6. Production and business aspects

The greatest highlight in recent years has been the growth of beekeeping. El Choloque is a pioneer in the Motupe district – going from five beehives in 2002 to 550 beehives in 2023. Forests are essential for the production of honey, particularly the hill forests, where farmers harvest multifloral honey, as well as unifloral *palo santo* and *hualtaco* honey, whose quality and market price are higher. Beekeeping has made the forest an "economic asset" for the inhabitants of El Choloque. Contributing to this was the progressive increase in knowledge about beekeeping through training and support received from public funds, such as Agroideas. By 2022, honey production had reached 6 900 kg for the year, coming from community-type hives (in the process of certification), the association (managed by each partner) and individual properties. For 2023, production of 8 250 kg is estimated.

A significant change occurred with the support that the community received from a project funded by the International Tropical Timber Organization[4] to improve family gardens, which largely substituted the uncontrolled extraction of wood that had taken place in the past (Medina and Calderón, 2008). In these orchards (mostly less than 5 ha), organic

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[3] This figure represents the average production of 48 farmers on 1.5 ha of land, of which 75 percent is planted with mango. The projection for 2023 was 1 600 tonnes/ha, but due to the unfavourable climatic conditions for flowering, the current production has dropped to only 20 tonnes/ha.

[4] Project titled "Rural and community extension workers involved in the integrated management of dry forests in the El Cardo sector – Tongorrape – Lambayeque"

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Bee hives in the forest producing organic honey

cultivation of fruit trees such as avocado, mamey, mango, passion fruit and plum increased. Mamey and mango jam is produced for cash income. This process is overseen by a group of members, directed by an associate agribusiness technician.

The shift to perennial crops was important because it affected overall land use, leaving only 10 percent in subsistence agriculture, such as beans and maize. Some families also combine their activities with small livestock farming, raising sheep that graze in the surrounding forests. Thus, this change contributed to the improvement of the living conditions in the community and to forest conservation.

The Japanese Technical Cooperation project for irrigation in 2018 helped introduce the gravity water conduction system, which was critical for the community. The project implemented seven irrigation modules on 15 ha for 56 producers and included the irrigation system and technical management. In turn, the beneficiaries were responsible for the construction or improvement of the waterwheel and motor pump. After the project, the irrigation systems were expanded in the farmers' plots.

2.7. Social aspects and impacts

The communal premises, whose construction began in 2004 through collective work and the financial support of professional partners and friends, currently serve as an office and warehouse. In 2010, two workshops for beekeeping and jam preparation were built, and in 2011, a meeting room and restrooms were added with support from the Municipality of Motupe.

With the "boom" of agricultural exports in the region, some of the younger generations have gone to work in companies in Lima to improve their living conditions. However, many of them return to invest in the family plots, using their improved skills to modernize the economic activities of El Choloque.

The participation of women in community decisions and economic activities has been strengthened over the years. Currently, 30 percent of the members of the ASPROBOS board of directors are women.

Awareness and educational campaigns continue in schools in the area. "What excites me the most is to see how the small dreams that the community had in the beginning have multiplied, to see the children occupying managerial and technical positions, and to see how women have been occupying decision-making positions", said Patricia Medina, technical advisor to ASPROBOS.

2.8. Environmental values and impacts

In the last 20 years, there has been a notable improvement in local family living conditions, with the modernization of farming practices and installation of basic services such as electricity, water and internet, all managed by the leaders of ASPROBOS.

The improvement of the economy and the living conditions of the population of El Choloque have positively influenced forest conservation, not only in the village but also in the Chiñiama River Basin, where neighbouring communities, in collaboration with the regional government, created the Moyán Palacio ACR.

2.9. Challenges and threats

The change in the regional political and economic scenario has favoured the expansion of industrial production of fruits for export by large companies, using advanced propagation and harvesting techniques, which has affected the forests and other plant formations in the area. This threat may not come to pass in El Choloque, with its small-scale production for the regional market, as long as the population maintains its level of organization and its respect for the assembly decisions. However, some farmers are starting to apply modern techniques to their own crops, something that could spread to the larger landscape in El Choloque.

The unfavourable macroregional scenario for forests has resulted in lack of governmental support for environmental projects in general. Several public investments have been shelved or have a very lengthy and slow approval process, although this was partly caused by the COVID-19 pandemic.

More public–private investment projects should be promoted with banks associated with businesspeople who demonstrate the sustainability of their activities. In this regard, there is still much to be done in terms of raising awareness and educating the population and businesspeople on forest conservation and sustainable land use.

Another challenge is the lack of information on the flora of the dry forest and its potential for product development and added value (Yachi, 2018).

Algarrobo, an emblematic species, is suffering from an unknown disease caused by a complex of insects and fungi, which seems to be exacerbated by climate change (SERFOR, SENASA and INIA, 2022). Another contributing problem is the overuse of groundwater due to the intensification of

Members of the ASPROBOS cooperative in the community hall of El Choloque

CASERIO EL CHOLOQUE

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agriculture, affecting the resilience of the *algarrobo* trees. As a result, the normal production of 80 kg of mature algarroba fruits has been reduced to just 10 kg per year.

In the case of certified organic honey, the association requires a marketing system that makes this activity more profitable and that draws a greater proportion of the population (Yachi, 2018). Reaching (and keeping) the market is an important challenge for the community. As Díaz de Cerio (2010) stated,

> *The main challenge in this case is to face the lack of education of the national consumer, who is not willing to pay more for a product classified as "organic" despite the many certifications it may have. The buyer is unaware of the work behind each jar of honey and does not know, for example, how expensive the international certification body is. Maintaining said certification and engaging in organic beekeeping is tremendously demanding.*

The association is currently looking to partner with another community in the region (Salas) to reduce certification costs.

2.10. Opportunities

The implementation of the project "Sustainable management and restoration of the dry forest of the north coast of Peru"[5] has recently begun, with financing from the Global Environment Facility and support from FAO and the International Union for Conservation of Nature. This project, which includes Lambayeque, will promote the conservation and recovery of the dry forests of the Peruvian coast, strengthening the connectivity and resilience of prioritized ecosystems, increasing the adaptive capacity of populations, and generating sustainable local livelihoods.[6] This new project is expected to strengthen the Regional Control and Surveillance Board and contribute to improving the sustainability of the efforts in El Choloque.

Businesses based on the agrobiodiversity, including aromatic and medicinal plants, are also an area of opportunity. There is also potential to develop ecotourism, particularly in view of the proposal for the creation of the Moyán Palacio ACR.

Carbon credits present another opportunity to support the conservation of the dry forest. However, this opportunity will take time to materialize, since there is still a lot of uncertainty about methodologies and "rules of the game".

The collection and sale of seeds or reproductive material of species of interest for commercial or ecological restoration has the potential to provide complementary income to community members. With the support of ASPROBOS, the community could organize to collect forest tree seeds and produce seedlings in the nursery for sale in the region. This activity would greatly benefit from the activation of the network of leading organizations working in the dry forest area, which was initially supported by Bioversity International to produce seed from selected seed trees. Regional and local governments could also activate the demand for seeds for reforestation projects.

2.11. Partnerships

The business development of the community is present through the ASPROBOS experience, although it has not yet blossomed into a dynamic marketing system (Yachi, 2018).

The central objectives of ASPROBOS include the conservation of the forest (especially for provision of water for agricultural use) and the development of economic activities to improve the living conditions of families. Beekeeping is an activity they have been promoting, and there are currently 550 hives installed. An equipped packaging centre has been established with an HACCP (hazard analysis and critical control point) food safety certification obtained through their own resources. The association is currently working to present an ecotourism business plan to the municipality within the framework of a governmental fund (Procompite).[7]

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[5] For more information please visit www.thegef.org/projects-operations/projects/10541

[6] For more information please visit https://profonanpe.org.pe/bosqueseco/

The association currently sustains itself through sales of bee- and livestock-related products. Participating partners receive daily wages, which are set by the partners themselves. For example, the women who work in jam production earn Peruvian sol 50/day (around USD 13.5), which is much higher than the prevailing wage in the area. The funds obtained by ASPROBOS help cover working capital needs, inputs, administration, utilities and various improvements in the community.

The role of the association has been strengthened through steady growth, building of relationships with different authorities (municipal, provincial and regional) and continuous communication with them to report on progress and challenges.

2.12. Innovation, recognition and outreach

The initiative of the community of El Choloque has demonstrated to neighbouring communities and at the departmental level the importance of conserving forests and developing alternative activities (e.g. the production of certified organic honey) for the well-being of the population. One result is the periodic visits of students from regional universities[8] and a national university[9], as well as from other institutes (e.g. Instituto de Educación Superior Tecnológico Público, Íllimo).

The community work experience for restoration activities promoted by ASPROBOS – with the support of the UNDP Small Grants Programme – has been replicated in neighbouring communities (such as the Túpac Amaru de Kañaris community – Palo Blanco Sector and the Salas community – Cardal Sector).

The community seeks opportunities to participate in regional and national fairs, which is an effective means of marketing products and establishing contacts with customers.

3. KEY LESSONS LEARNED

- In farming community interventions, it is necessary to understand the governance structure of the community. State regulations sometimes violate this governance structure by focusing only on the community assembly and neglecting the local administration board. There are rules of use and intrinsic customs that are not written down; not taking them into account can generate conflicts.
- The community plays a fundamental role in local development. In the case of El Choloque, the community hierarchy has always been maintained to make decisions on forest management and agree on communal tasks and restrictions on forest use.
- A key aspect for the leadership of ASPROBOS was the direct execution of UNDP projects, which helped create an organizational culture. Moreover, funding was used efficiently and transparently, investing as much as possible in the same locality. Later on, with its management of public service projects and its leadership in the founding of the ACR, ASPROBOS established its position in the middle-lower part of the basin. And today, with its participation in the production of organic mangoes, ASPROBOS has a strong voice based on its track record.
- Farmer-to-farmer training and internships have been key tools in building capacities for production, management and community leadership, among other features.

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[7] For more information please visit https://procompite.produce.gob.pe/

[8] Universidad Nacional Pedro Ruiz Gallo, Universidad Católica Santo Toribio de Mogrovejo and Universidad Señor de Sipán

[9] Universidad Nacional Agraria La Molina

4. FUTURE OUTLOOK

ASPROBOS has trained leaders to be grounded in respect for the environment. This approach will enable the organization to continue to sustainably manage its resources, innovate in production and establish synergies with local public and private entities, as well as at regional and national levels.

The condition of the dry forest is expected to have improved in these last two decades. The next step is to evaluate the 2004 FMP and plan new activities for the coming years, with the use of non-timber forest resources (e.g. essential oils) being the priority.

El Choloque has served as a model to replicate, and ASPROBOS plans to become a leading space for the exchange of experiences and knowledge in the dry forest, providing food and lodging for visitors and offering tourist visits to the forest. This pride of identity that is taking hold in the community is reflected in the words of the President of the Residents' Committee, Ruperto Orellano: "We are part of sustainability. Everything is due to sustainability, nothing without it. Because of sustainability, we have reached where we are today."

Good management, conservation and restoration practices in the area will need to be documented, followed by the preparation and dissemination of illustrated manuals on how to implement similar interventions in various scenarios. This could be a joint task of the various local organizations that have already been working on productive conservation.

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A SOCIALLY, ECOLOGICALLY AND ECONOMICALLY SUSTAINABLE COMMUNITY FORESTRY MODEL

Roger Villalobos and **Fernando Carrera**, CATIE

NAME OF FOREST	Ejido San Diego de Tezains
LOCATION	Durango State, Sierra Madre Occidental, Mexico
AREA (ha)	60 000
MANAGING ENTITY	Ejido San Diego de Tezains
MANAGEMENT OBJECTIVES	Forest management for wood production; forest conservation; tourism development; local social development
FOREST TYPE	Natural pine forest

1. INTRODUCTION

The community forest management process in Tezains, documented as an exemplary case of forest management by FAO in 2010, is an outstanding and interesting case of widely participatory forest management, with a strong social focus. The process has been successful in terms of its financial and silvicultural performance to this day.

The initiative comprises a set of forestry companies established under the ejido system, a legal status of collective land ownership typical for Mexico and created as part of the Mexican Revolution at the beginning of the twentieth century. This collective community initiative is regarded as a social forestry enterprise according to the General Law of Forestry Development.

The Ejido San Diego de Tezains has 374 *ejidatarios* or members (49 percent of them women), who have rights over the management of the ejido territory and its resources. The total population in the territory is 1 600, most of whom are relatives of *ejidatarios*. The main economic activity in this community is forestry, although agricultural activities are carried out in the rest of the ejido territory.

2. KEY CHANGES AND DEVELOPMENTS

The San Diego de Tezains Ejido has not only continued to function well since its recognition as an exemplary case of forest management in 2010, but it has evolved positively as a community process and in its capabilities as a processing company for forest products.

2.1. Management objectives

Forest management and wood production are the main economic activities in Tezains. Forest management has a clear focus on the maintenance of forest land use and the productive potential of the forest. Production includes the use and transportation of raw materials, as well as processing and marketing through community companies. There is also the objective of productive diversification through tourism development (although still poorly developed) and through trade in ecosystem services, which is in its initial phase. Forestry activities generate jobs and income flow to the community, as well as the periodic distribution of dividends among all *ejidatarios*, including those who reside outside the community in other territories or even outside Mexico.

2.2. Type and condition of forest and scale of operation

The Ejido San Diego de Tezains is located in the State of Durango, Mexico, in the mountains of the Sierra Madre Occidental. It was established in 1933, originally with 12 041 ha. It was expanded to 48 000 ha in 1970 and to 60 000 ha in 1995, of which 26 038 ha are effective commercial forest management areas located between 1 850 and 3 047 metres above sea level (Alvarado, 2010). At the beginning of the ejido, livestock activity predominated; however, forestry is currently the primary economic activity.

The productive forest area in the ejido is made up of well-preserved natural pine-oak forests. Two types of forest stands are recognized: more homogenous stands under regular management (clearcut) and those that are under irregular management (selective harvesting). Every year, around 90 000 m^3 are harvested in the intervention area of 1 600 to 2 000 ha.

2.3. Legal status and management structure

An ejido, which has been regulated in Mexico for many decades, is a form of stable tenure that provides legal security to *ejidatarios*. It is a collective tenure; therefore, individual people do not have property titles. The physical spaces where any person in the community builds a house, a property or building for commercial purposes, or an agricultural production area, are assigned through communal agreements. Decisions on the extent and form of management of the forest area are made through collective processes in the *ejidatario* assemblies and are implemented under the supervision of a board of directors (called commissariat) that is elected every three years.

The status of *ejidatario* was assigned to the beneficiaries at the time the ejido was established; the title of *ejidatario* can be inherited or transferred to a maximum of two beneficiaries. Only the *ejidatarios* have the rights to participate in the assemblies, elect the *commissariat* or receive profits from the commercial activity of the ejido. Their relatives can live in the territory and be employed in its companies when there is opportunity, but they do not have the same rights. This ejido has stood out for its strong organization, thorough awareness of duties and rights, and healthy functioning of its assembly (Heredia-Telles *et al*., 2021).

2.4. Regulatory environment and government support

Above the decision-making power of the ejido, there are federal laws that must be respected and that identify, for example, lands for forest use or that regulate forest management practices. The representatives of this community organization have a respectful relationship with the forestry authorities of the Secretariat of Environment and Natural Resources (SEMARNAT), who have the authority to supervise them and, if applicable, sanction them, but the productive activity is carried out in a positive institutional context. This is something worth highlighting, since in Latin America it is common for forestry producers to complain of a negative attitude on the part of the authorities.

The ejido has received substantial support from the National Forestry Commission (CONAFOR) through donations earmarked for the purchase of equipment and development of infrastructure, particularly since 2001. In the past, CONAFOR subsidized the costs of the certification processes, but does not at present. Government institutions effectively supervise forest management and at the same time promote productive forestry activity, and this is a key success factor in this process.

2.5. Forest management practices

The so-called regular management, carried out in the most homogeneous and least diverse forest stands, involves complete clear felling of blocks with retention of seed trees. Stand recovery is through natural regeneration or enrichment planting, and the harvesting cycles is 90 years. These blocks or stands range from 1 to 17 ha (average of 6.8 ha), and about

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Natural regeneration in a regular-type clear-cutting block one year after logging

60 seed trees per ha are retained. Interventions take place on a total of around 185 ha per year in the ejido. Biomass produced through thinnings is used for different purposes. There is controversy around the relevance of post-logging enrichment, the cost of which is significant, as scientific evidence seems to be lacking to justify the investment given the forest's ample capacity for natural regeneration.

In the case of irregular management, trees that do not have the best characteristics are selectively cut (negative selection). Trees left after each harvest will eventually be harvested, but the practice promotes a forest with healthier and stronger trees with desirable forms, which remain in the forest longer to produce seeds. This system takes advantage of the fact that all forest biomass is usable and has some commercial value. Each intervention aims to improve the forest in terms of the shape and growth of future harvest trees. The vitality of the forests improves over time. The cutting cycle is 15 years.

The original natural composition of the forest is a mixture of pine and oak. There is an ecological challenge in that pine species have a greater and more continuous demand in the market. Pinewood is softer and less durable than oak, but it is easy to process and dry. Although oak wood is harder and more durable, market demand for it is lower than for pinewood, and its processing is more difficult. Therefore, the growth and regeneration of pine is favoured in forestry interventions, which could lead to forests becoming less diverse, more homogeneous and dominated by pine, affecting the forests' resilience and ecological dynamics. From an ecological perspective, it would be ideal to promote oak markets and a more comprehensive vision of the forest, thus safeguarding its diversity.

Forestry production in Tezains has been FSC-certified since 2000, which demonstrates that good management practices have been followed consistently for the benefit of the forest and for the safe working conditions of the people involved. The FSC certification is also recognized by SEMARNAT through the Federal Attorney for Environmental Protection, which facilitates the legal approval of activities. Additionally, the ejido received the National Forestry Merit Award from CONAFOR from 2007 to 2011.

2.6. Production and business aspects

Commercial forestry activity in Tezains has been stable and profitable, based until now on a permanent and substantial wood market, particularly for pine. The main products are wooden boards and rulers of various dimensions, and smaller materials are used for the production of broomsticks. All sawdust waste is used as a source of energy. The main buyer of this biomass in Durango is a processing plant of the Arauco industry, a well-known Chilean forestry company.

Although the volume handled is not as high as that of other ejidos, Tezains has shown business vision. Development for its three sawmills began in 1975, with the second sawmill built in 2015 (CONAFOR, 2018). Its recently completed plywood plant involved an investment of at least Mexican

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Recently harvested area under irregular management, which shows a healthy forest stand and the strategic placement of waste wood to reduce soil erosion

peso (MXN) 60 million (USD 3 510 825),[1] partly contributed by CONAFOR. The organization of the Tezains allows them to maintain permanent productive activity throughout the year, and annual productivity has been stable for the last 20 years.

From an administrative and managerial point of view, the ejido is exemplary for its ability to maintain solid productive activity over the years, while at the same time it has improved its administrative processes and industrial capabilities.

However, there is a governance aspect that could be improved. From an administrative point of view, it is recommended that forestry companies – while owned by the ejido and supervised by its board – operate as independent entities with a distinct legal personality. These companies should adopt a management mechanism focused on business objectives, separate from the discussion of social issues within the community.

The resolution of conflicts and issues of communal coexistence and social development in the territory should be handled by a different set of actors than those in business management. In Tezains, such a division does not exist. The *commissariat* resolves issues related to both community development and the forestry business. It is a difficult challenge to manage forestry companies with objective criteria focused on productive efficiency when all personnel have family ties with the *ejidatarios* and their commissariat, and when some of the small companies that sell wood-harvesting and transportation services also belong to the *ejidatarios*.

According to the ejido rule, the *commissariat* must be renewed every three years, and individuals cannot be re-elected in consecutive periods. Profits from forestry activities are distributed among *ejidatarios* every three months, given the high profitability of the activities, and only around 30 percent of the profits are left for reinvestment. The distribution of profits is prioritized over analysis of the company's needs. Part of the profits is also used for social investment in the community.

Furthermore, there are three companies linked to the ejido, but the divisions between them are not clear. The ejido and its *commissariat* constitute a company in itself, as they manage salaries and production processes. Tezains is the company in charge of sawmills and marketing and is also directed by the same commissariat. Finally, Infosandi was created to develop innovations in the finished products such as plywood. It has a processing industry established outside the ejidal territory, in the nearest town of Santiago, close to the markets. A separate manager who works with greater independence was recruited for Infosandi, but this company is still in the process of consolidation and has faced a contraction and strong competition in the market for wood products.

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[1] Converted at a rate of 1 USD = 17.9 MXN

Given proper administration and business growth, the ejido has managed to continue generating profits all these years. However, the wood market is evolving, and Mexico, like other Latin American countries, is receiving imported wood from countries such as Chile, Brazil and the United States, which compete through their industrial efficiency, ability to deliver large volumes with standardized characteristics on time, and rigor in the dimensions and finish of the delivered product. Forestry companies such as those in the ejido will need to modernize and review their management capabilities, either to survive in the face of this competition or to develop new market strategies.

Although the ejido has had the vision of developing tourism, taking advantage of the natural attractions in its territory, this opportunity has not been developed to its full potential. Situations such as public insecurity in Mexico and the effect of the COVID-19 pandemic on the movement of people have caused attention to wane regarding this activity. However, the ejido has a tourist site called Paraíso de San Diego, which is visited by locals and offers trails, camping space, an activities room and rental cabins. This site could have significant commercial potential with proper management and a good marketing strategy, especially given its relative proximity to the port of Mazatlán, which receives foreign tourists.

As part of productive diversification initiatives, the ejido is preparing to negotiate a possible sale of carbon certificates from an area of 28 596 ha of its territory, with support from the National Institute of Forestry, Agricultural and Livestock Research. It has also received funds from the municipal government to protect a basin for water services, although there is no established payment system yet. The area is also important for provision of water resources, but there are no current initiatives for it to become integrated into a financing strategy.

2.7. Social aspects and impacts

The production model of the Tezains ejido has generated jobs in the forestry industry for men and women in the community, promoted local companies that use and transport wood, and contributed to the maintenance of a local economy by supplying lodging, food and other services.

Furthermore, the ejido prioritizes activities for the benefit of residents and communal development, such as contributions to education and health infrastructure. The ejido has provided scholarships to young people from the community. Some of these young people have already become professionals, and some work for the ejido – for example, as the general manager of field activities and the person in charge of the certification processes.

Certification processes have helped increase the participation of women in production and decision-making. In the distribution of dividends, there are

Some **ejidatarios** *have established small companies that offer their services for the use and transport of wood from the ejido*

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established quotas to support schools and women; moreover, support is given to churches and families needing to make funeral arrangements.

2.8. Environmental values and impacts

Forest management in Tezains has made it possible to keep the forest stands stable and safeguard their fundamental functional features. It adheres to national regulations and the periodic recommendations of the certifying body. The forest area has been maintained without any deforestation problems.

At some point there were problems with illegal farming, but this practice is not common today. The *ejidatarios* show a high level of commitment to good forest management and have incorporated it as part of their productive culture. Areas where regulations do not allow timber harvesting are respected.

When the 2015 management plan was updated, a biodiversity study was carried out with satisfactory results. Although there was legal sport hunting in the past, now hunting is only for self-consumption based on the quotas allowed by SEMARNAT. Hunting activities have declined since the COVID-19 pandemic, but it could be an alternative for productive diversification in the future.

2.9. Challenges and threats

There are three main types of challenges: business management; competitiveness in the markets; and governance and legality in the region.

Regarding business management, as mentioned before, it may be necessary to strike a balance between community development and company management, to guarantee efficient business management focused on productive objectives. Additionally, financial administration should not sacrifice the growth and modernization of the company in order to maintain a permanent distribution of dividends. This may require periodic analysis of the company's performance and improvement needs.

In relation to competitiveness in the markets, competition from efficient and modern international wood suppliers is growing, and market fluctuations and crises may become more frequent. Forestry companies must remain vigilant of trends and continuously explore new products and market strategies. The current ejido's governance system may not be the most efficient for facing the current and future market challenges.

The governance of rural regions in much of Mexico and Latin America is suffering from interference from organized groups linked to illegal activities such as drug trafficking. These groups can influence commercial activities, the use of land in political processes, freedom of movement and other aspects of people's lives, and may also encourage drug consumption among young people. For the moment, these types of groups are respecting the

The forestry industry in Tezains is an important generator of employment

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forestry activities in this ejido and the forest itself, but they constitute an element of concern in terms of governance.

2.10. Opportunities

This community forest management process has demonstrated a high degree of organization, technical knowledge and development of a community forest culture. In addition to its assembly and *commissariat* structure, it has an advisory council that strengthens business decision-making. Examples like Tezains, where an organized community is successfully conserving an important forest ecosystem while leading its own process of social development, should be more widely recognized and valued, both nationally and internationally.

Although CONAFOR has initiatives to recognize excellence in forest management, and the Tezains ejido has previously been recognized as an outstanding case, there is a need and opportunity to communicate more effectively, to society and political decision makers, the relevance of maintaining and promoting these forms of community forestry. It is pertinent to make the Mexican state and the private sector aware of the importance of consuming wood products produced in an ecologically sustainable manner and linked to development and social justice, and to generate campaigns for the consumption of these products under approaches of social and environmental responsibility.

Organizations that bring together forest ejidos may be an appropriate forum to publicize and promote sustainable forest production as a conservation and comprehensive development strategy.

2.11. Partnerships

The ejido has had valuable alliances throughout its history, in particular with CONAFOR, which recognizes it as a well-performing and responsible community company and has sought to collaborate with its growth in various ways. The ejido also has the support of the National Institute of Forestry, Agricultural and Livestock Research, a federal research institution that monitors the ejido's management processes and has published several reports on the growth and state of the forests.

The ejido is part of the General Emiliano Zapata Union of Ejidos and Forest Communities, which groups around 70 ejidos. There is an interesting potential to take advantage of this type of platform to make the positive work of community forestry known to Mexican society and relevant markets, but to date the topic has not been very developed. Another partnership is with the Municipality of Durango, which has a certified wood consumption policy; this type of approach should be encouraged in other government agencies.

2.12. Innovation, recognition and outreach

As described so far, the ejido has enjoyed a certain stability in the market for its products, but it is likely that this reality will change progressively due to the presence of strong competitors and the potential occurrence of national and international economic crises. Therefore, it is important that ejido companies prepare for such challenges through strategies such as permanent improvement in the presentation and finishing of their products, and the development of new products and new market strategies.

It should be noted that this ejido has about 15 professionals as its staff. The creation of the Infosandi company shows that the ejido has a vision of improvement and modernization that must continue to be strengthened. The positioning of community forestry as a successful strategy for biodiversity conservation and social development has depended more on external initiatives, such as recognition from FAO and CONAFOR, than on a strategy promoted by the ejido itself or by the platforms that integrate the ejidos. This is an area that would be worth promoting.

3. KEY LESSONS LEARNED

- Integrating forest management and the production of forest goods into the community's economy and livelihood strategies is a key pillar of forest conservation. For the community, it makes sense to protect an ecosystem that plays an essential role in their economy.
- Over the years, the practice of forest management—along with the processing and marketing of forest products—has fostered a strong forestry culture in the community of San Diego de Tezains. As a result, forest conservation has become a natural, everyday part of life, carried out with full community participation.
- Forest certification has helped the community to sustain continuous review and improvement in various facets of forest production and management, even though it has not led to better prices for their products.
- Government support for community-based forest management—such as the technical and financial assistance provided by CONAFOR and recognition of good practices by SEMARNAT—helps create a positive, respectful and technically focused relationship between the supervising agencies and the ejido. This, in turn, fosters an enabling environment for sustainable forestry business.
- A key factor in the sustainability of a forest ecosystem is the availability of a market for products derived from native species. When these species are valued by the market, the forest gains economic value, encouraging sustainable management. This highlights the importance of policies that promote markets for native species.

4. FUTURE OUTLOOK

The San Diego de Tezains Ejido has demonstrated its ability to develop a productive model that has worked excellently, both in a financial sense and in social development, while at the same time becoming an exemplary case of participatory ecological conservation. This production model does currently face challenges, such as an increasingly open and competitive market, in a context of more frequent economic changes, which requires that the ejido demonstrate its capacity for adaptation and innovation. To this end, it may be pertinent to review and eventually improve the current internal governance and management mechanisms of productive companies. In parallel, the ejido needs to steer clear of the activities of organized criminal groups in this region and keep its governance focused on its objectives of conservation and social development.

In such a context, government support for sustainable forestry, participatory governance mechanisms and the development of markets that recognize these values are more important than ever. The ejido itself, as well as the organizations of which it is part, must raise awareness of the ecological and socioeconomic relevance of sustainable forest management, particularly by local communities.

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LATIN AMERICA AND THE CARIBBEAN

A COOPERATIVE STRIVING TO PRESERVE THE CULTURE AND THE BRAZIL NUT FOREST IN THE BRAZILIAN AMAZON

Pollyanna Coêlho de Sousa, ICMBio (Chico Mendes Institute for Biodiversity Conservation)

NAME OF FOREST	**Iratapuru River Sustainable Development Reserve (Reserva de Desarrollo Sostenible del Rio Iratapuru)**
LOCATION	**Laranjal do Jari, Mazagão, Porto Grande and Pedra Branca do Amapari municipalities in the State of Amapá, Brazil**
AREA (ha)	**806 184**
MANAGING ENTITY	**Institute of Environment and Territorial Planning of the State of Amapá, Iratapuru River Sustainable Development Reserve Management Council, and Iratapuru River Mixed Cooperative of Producers and Extractivists**
MANAGEMENT OBJECTIVES	**Collection and processing of Brazil nuts and other non-timber forest products; biodiversity conservation; generation of socioeconomic benefits for communities**
FOREST TYPE	**Natural tropical moist forest[1]**

1. INTRODUCTION

The Mixed Cooperative of Producers and Extractivists of the Iratapuru River (COMARU) was established between 1991 and 1993 to protect the interests of the São Francisco do Iratapuru community, which had been suffering from the devaluation of Brazil nut (*Bertholletia excelsa*) prices by intermediaries, as well as from pressure from a land dispute with a local company. In 1997, territorial security was guaranteed with the creation of the Iratapuru River Sustainable Development Reserve (RDSI) (**Figure 1**). Between 1999 and 2001, COMARU established a contract with the company Natura[2], which has resulted in numerous benefits, such as the creation of the Iratapuru Fund in 2004, which was financed through the profit-sharing contract. This partnership also supported a project to revitalize the Brazil nut oil agroindustry (Tavares *et al.*, 2010; Toledo, 2016).

Currently, the community of São Francisco do Iratapuru has 78 resident families, and the cooperative has 120 members. The installation of the San Antonio Hydroelectric Power Plant in 2014 resulted in the displacement and relocation of these families. It also brought negative environmental impacts, including a decline in water quality and alteration of the landscape, as well as social changes, such as an influx of outsiders who practise hunting and predatory fishing, along with an increase in violence. On the positive side, the development led to improvements in infrastructure, including the construction of a school, a health centre and a sports field, which have been well received by the community.

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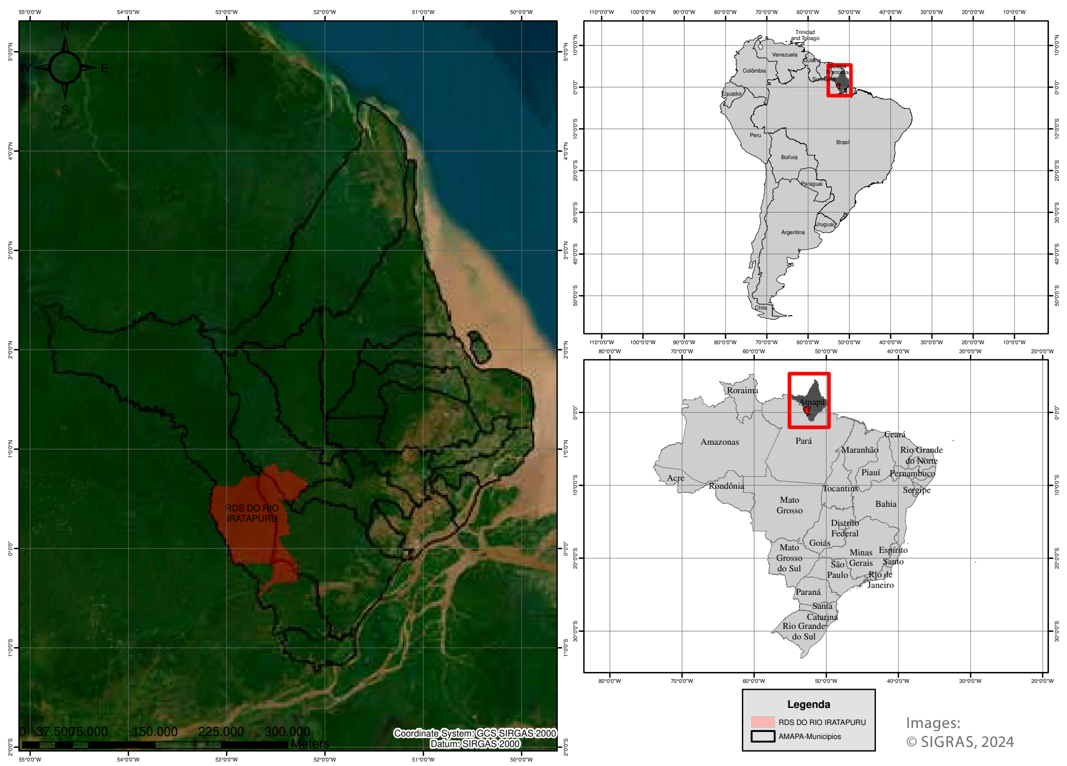
[1] Brazilian classification: dense submontane ombrophilous forest; dense lowland ombrophilous forest; and dense alluvial ombrophilous forest

[2] For more information please visit www.naturabrasil.com

Figure 1. *Location of the Iratapuru River Sustainable Development Reserve, Amapá State, Brazil*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Argentina
Chile
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Amapá
Amazonas
Pará
Acre
Rondônia
Maranhão
Ceará
Rio Grande do Norte
Piauí
Pernambuco
Tocantins
Sergipe
Bahia
Mato Grosso
Distrito Federal
Goiás
Minas Gerais
Espírito Santo
Mato Grosso do Sul
São Paulo
Rio de Janeiro
Paraná
Santa Catarina
Rio Grande do Sul
Legenda
🟥 RDS DO RIO IRATAPURU
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Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

In 2022, COMARU supplied 30 tonnes of Brazil nut oil for Natura; in 2023 this amount decreased to 10 tonnes. The high production capacity of the cooperative and the high productive potential of the region motivate the current management of the cooperative to access new markets, signing new contracts that will be essential to stabilize family income and the company's sustainability.

2.KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The RDSI Management Plan (GEA, 2015) was approved in 2015. In addition to compiling exhaustive information related to socioenvironmental aspects and impacts, the plan also establishes rules of coexistence, good management practices, harvesting intensity, environmental education, and economic activities that communities are allowed to undertake. Although there is no hunting and fishing agreement, the inhabitants follow the instructions in the management plan and hunt only what is necessary for family consumption. In addition to Brazil nuts, forest species such as rubber (*Hevea brasiliensis*), *balata* (*Manilkara bidentata*), *maçaranduba* (*Manilkara huberi*) and andiroba (*Carapa guianensis*) were identified as valuable species, some of them for homeopathic medications.

At the community level, the management objectives have not changed over the years. The primary focus of forest management continues to be on the sustainable collection and processing of Brazil nuts, harvesting and value-added processing of other non-timber forest products, biodiversity conservation and socioeconomic benefits for communities.

2.2. Type and condition of forest and scale of management

The land cover assessment by Projeto MapBiomas (2023) indicates that deforestation has not been widespread in the RDSI region, although some residents have raised concerns about deforestation around the reserve, citing the presence of loggers in the area. However, the forest is well-preserved and healthy, with dense natural regeneration. Extractivists do not collect all the fruits, allowing the local fauna to feed and a soil seed bank to form. Each family takes care of the forest, with special attention to the Brazil nut productive trees. The residents can now collect fruits from naturally regenerated trees. This knowledge is further enhanced through training on good forest-management practices, which the cooperative offers annually.

2.3. Legal status and management structure

The Management Council of the RDSI is the entity responsible for management. The Council was revitalized in 2013 and is still active, holding an annual assembly. According to Federal Law No. 9.985/2000, the RDSI is administered by a deliberative council made up of the managing public body (the Secretary of State for the Environment of the Government of the State of Amapá – SEMA/AP), other interested public institutions (the Institute of Extension, Assistance and Rural Development of Amapá, Amapá Terras, the State Public Ministry, and the Municipality and Municipal Chamber of Laranjal do Jari), representatives of civil society (the Jari Foundation) and representatives from traditional communities (COMARU).

The RDSI Management Plan began to be developed in 2008, based on an alliance between the Government of the State of Amapá and WWF Brazil. In 2013, the SEMA/AP issued a technical opinion indicating information that needed to be updated; the revised document was published in 2015. Another management instrument is the Internal Regulation of Agroindustry, which is currently being prepared.

In 2018, the then Natura Fund was reformulated and renamed the Iratapuru Fund, managed by a committee made up of five local organizations (COMARU, BioRio Association, SEMA/AP, Natura and the Jari Foundation).

2.4. Regulatory environment and government support

The creation of the RDSI was supported by Federal Law No. 9.985/2000, while Law 11.284/2006 guarantees traditional peoples and communities the right to demarcate their territories as a matter of priority. Currently, the community of São Francisco

The village of São Francisco do Iratapuru

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do Iratapuru suffers from a lack of territorial regulation since it has not received the title to the newly occupied areas following its relocation in 2014 for the construction of the hydroelectric dam.

Law 12.651/2012 created the Rural Environmental Registry (CAR), which is a public registry of all rural properties nationwide. The aim is to integrate the environmental information of properties, enabling control, monitoring and socioeconomic planning, as well as to combat deforestation. The RDSI is not registered in the CAR, and the residents of São Francisco village are not aware of this registry. This fact represents a risk for the communities, since current problems related to the CAR include overlaps with protected areas and the misuse of the registry to claim ownership – a practice commonly associated with land grabbing.

Environmental protection is guaranteed in the RDSI Management Plan, which is structured into thematic programmes: operational; protection and management; research and monitoring; environmental education; and public use. Each programme has a general and specific objective, as well as indicators of success and standards and guidelines for implementation.

Regarding the operation of the agribusiness, the cooperative has complied with the legal requirements, with an up-to-date operating permit and operating license approved by SEMA/AP.

2.5. Forest management practices

The main intervention carried out in the forest is the opening and maintenance of trails (*estradas*) for Brazil nut collection to make the activity safer and more efficient, causing minimal impact on the forest. The intensity of collection is established by the cooperative, which manages the contractual demands together with Natura.

The association carries out campaigns to clean rivers and prevent littering in the community, with the participation of schools during the holidays. There is no record of forest fires in the reserve or its surroundings, and educational campaigns are carried out annually.

One of the recommended actions to improve COMARU's forest management is the mapping of productive Brazil nut trees, which is currently underway. A forest seedling nursery has been proposed to support the restocking of the forest. However, at this time, extractivists are relying on natural regeneration to ensure the replenishment of Brazil nut trees.

In 2004, COMARU was certified under the FSC standard for an area of 23 330 ha. In 2014, the certification (covering both forest management and chain of custody) was terminated because of challenges in understanding the technical language of audit reports, difficulties in contracting specialized consultants, and the immaturity of the

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A Brazil nut tree in the Iratapuru communal forest

comaru
castanha do brasil
comaru
castanha do brasil
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comaru
castanha do brasil

Brazil nut oil produced by the Mixed Cooperative of Producers and Extractivists of the Iratapuru River

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cooperative's organizational and administrative management. However, the loss of certification did not change the way the cooperative manages the Brazil nut groves. Good forest management, based in traditional practices and care for worker health and safety, continued to be upheld.

2.6. Production and business aspects

Brazil nut production areas are located in family lots, whose boundaries are still in the process of georeferencing, although the limits are respected by each family. These lots are called *colocações* and are generally named after the owner. Family production planning is associated with the demands from Natura. From November to December of the year prior to the harvest, the company holds meetings with the cooperative to establish the amount of oil to be purchased. After defining the required volume, the managers divide this amount among the members. Of the 120 cooperative members, 57 signed a supply contract with the cooperative at a fixed price of Brazilian real (BRL) 330 (USD 66)[4] per hectolitre. On average, a family can deliver up to 50 hectolitres, which is equivalent to an income of BRL 16 500 (USD 3 300) per year.

The organizational and administrative management of COMARU has improved over time. In the first years of the foundation, there were difficulties in handling documentation, accountability, review of the contract with Natura, management of the agribusiness, training, and management of teams from different sectors. These factors compromised the quality of the product, evidenced in the high acidity of the oil produced.

The organization worked hard to improve the quality of management and hired specialized technicians in food safety and in safety and health at work. It partnered with researchers from state and federal universities, the Organization of Brazilian Cooperatives, and the Brazilian Support Service for Micro and Small Businesses. There is also planning for environmental and labour risks and hazards. An annual training plan covers the cooperative's areas of activity, focusing on food safety and good management practices. When new workers are incorporated, they go through an integration process with the teams and receive training for their area of work. In addition, improved accounting has facilitated productive and financial planning, prevented debts, maintained transparency, and gained the trust of the members.

The cooperative transfers members an advance of 50 percent of the total value of the contract. The other 50 percent is divided into two instalments: one part transferred upon delivery of the Brazil nuts and the other transferred after the sale of the oil. In this way, the extractivists can acquire the necessary inputs (food, fuel, tools and materials) to maintain the family livelihood. To enable the advance payment, COMARU receives an advance of 30 percent of the total contract amount from Natura and uses loans from solidarity funds such as Sitawi and Conexus[5] to fill the gap. In 2023, only the Sitawi loan was needed to cover the payments to producers. One of the interviewees reported that, on occasion, this payment is delayed, making economic planning difficult for the family. In times of economic need, the extractivists sell the production surpluses to intermediaries in the region, harvesting even in the hazardous month of February when powerful winds and rains cause the heavy fruits to fall, and returning to the forest to collect what is left after delivering the agreed volumes to the cooperative.

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[4] The average conversion rate from BRL to USD in August 2023: BRL 1 = USD 0.20

Regarding the infrastructure, manual processing in 2010 has improved with new machinery (a sheller, hydraulic press and rotary press) acquired in 2013 and 2014 with resources from Natura, the cooperative and the Iratapuru Fund.

One of the difficulties is the obsolete machines, which compromise productivity. On the current machines, a hectolitre of nuts yields 6.69 litres of oil, while new machines would produce 7.69 litres. Access to financing is needed to upgrade the equipment, which will also reduce working time. Other benefits of modernizing the equipment and facilities include improved worker safety and comfort, lower production costs due to reduced fuel consumption, and more efficient processing of orders.

The other products that the community sells are handicrafts made by the residents, samples of copaiba (*Copaifera* sp.) resin oils, andiroba (*Carapa guianensis*) oil and *cumaru* (*Dipteryx odorata*) almonds. These products are sold by families to tourists and visitors passing through the community.

"The cooperative has improved and continues to be a success story, with products highly sought after by new buyers. The quality of life of the people has improved. Other product chains that can be developed are of *pracaxi* (*Pentaclethra macroloba*), *andiroba*, copaiba and *cumaru*", said Maria José Ferreira Nogueira, a COMARU cooperative member and warehouse assistant.

2.7. Social aspects and impacts

Complying with Natura's contractual requirements, the cooperative signs a supply contract with each member, who in turn signs a contract with the day labourers who collect the Brazil nuts. When the cooperative began to draw up the contracts, the Union of Rural Producers accompanied the discussions and the consolidation of the drafts.

Social conflicts and challenges include the following:

- the sale of Brazil nuts to people outside the community, such as intermediaries, who move freely through the village areas and forests;
- tenure insecurity of the inhabitants of São Francisco village, who did not receive property titles to the lots where they were relocated and thus cannot access bank financing. Several meetings have already been held with the hydroelectric company, with no progress. The residents have reached out to the public ministry and a trial is underway. The Institute of Extension, Assistance and Rural Development of Amapá must re-register families in the National Registry of Family Agriculture, but this task has not yet been scheduled; and
- easy access for outsiders – mainly from Laranjal do Jari – to fish and hunt in the community territory, which generates insecurity among the population, since these individuals do not follow the rules of good community coexistence and the prescriptions set out in the RDSI Management Plan. Two measures taken to avoid environmental impact are a complaint submitted to the Environmental Battalion and inspection by the SEMA/AP.

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[5] For more information please visit https://sitawi.net/; https://www.conexsus.org/

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Women packaging Brazil nuts for the Iratapuru River Mixed Cooperative of Producers and Extractivists

A notable event in recent years was the restructuring of the Iratapuru Fund. One of the projects with the greatest social impact was implemented by the BioRio Association, which provides scholarships for students who finish high school and intend to enter higher education. The budgeted amount is BRL 200 (USD 40) for secondary education, BRL 300 (USD 60) for technical education and BRL 500 (USD 100) for higher education. To access the Iratapuru Fund, representatives of community organizations receive training to prepare their projects.

The cooperative prioritizes the hiring of Iratapuru community members, although residents of surrounding communities are also hired. The commitment of the cooperative members is considered good, although actions are needed to strengthen the participation of young people.

The Brazil nut trade is the main source of income for families, and some benefit from public policies such as the Bolsa Família Programme[6] and programmes for retirees and pensioners.

2.8. Environmental values and impacts

One of the environmental impacts observed in the management plan in recent years is the decrease in the productivity of the Brazil nut trees from 50 to 30 hectolitres per year. Local extractivists attribute this to poorer pollination from the decrease in the number of bees in the forest. It is believed that the bee population has been affected by changes in the landscape, including flooding of large areas of forest, caused by the installation of the hydroelectric dam. Increased erosion has also been observed in the forest, which causes the Brazil nuts to fall.

Water pollution is one of the greatest impacts recorded after the construction of the San Antonio Hydroelectric Plant. However, the change in water colour and smell could also be due to the extensive illegal mining in the region. The number of fish has decreased, which could also be caused by predatory fishing practised beyond the limits set in the management plan.

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[6] For more information please visit https://www.gov.br/mds/pt-br/acoes-e-programas/bolsa-familia

The population notes the potential impacts of climate change, such as changes in the seasonality of fruit trees, reducing the quality and quantity of oranges harvested, and causing the irregular and decreasing harvest of Brazil nuts. In places where river beaches are formed in summer, there is now a mudflat and the trees of the riverside forest have died. More mosquitoes have appeared, as well as a new mosquito (*bizobó*) similar to a fly or horsefly.

2.9. Challenges and threats

Among the main threats observed are territorial insecurity and irregularities in the Rural Environmental Registry, which can weaken land management processes and increase the vulnerability of natural resources. It has become urgent to investigate and monitor the socioenvironmental impacts from the hydroelectric power plant and to propose mitigating measures, since families have reported several disturbances, mainly in relation to water quality.

Further investment is needed to upgrade the production infrastructure, reduce production costs, make timely deliveries on orders, and improve the health and safety of workers. There is intense noise pollution from the machines, and the building structure is worn and needs renovations. A project is underway to revitalize the agribusiness using the Iratapuru Fund.

Transport is costly and time consuming, but could be improved through government investment in road maintenance. The cooperative is purchasing a van to facilitate the movement of equipment and reduce freight expenses.

There are still doubts about the environmental sustainability of Brazil nut extraction and seed quality control, which can be a risk affecting market access opportunities. For this reason, the coordination of COMARU with other cooperatives and companies in the sector, in addition to research, can help to plan for actions to address these risks.

2.10. Opportunities

Moving forward, COMARU has many opportunities that need to be turned into development projects. As it is a preserved area and now has advanced organizational capacity, it could pursue a return to FSC certification for forest management or ecosystem services, or seek fairtrade certification. These certifications could enable the cooperative to secure higher prices and receive payments for the conservation of environmental services provided to society.

In addition to Brazil nuts, there is potential to develop value chains for other products, such as copaiba, *cumaru* and *andiroba*. These initiatives could be planned alongside the revitalization of the industrial park, with a view to processing other raw materials in addition to Brazil nut oil.

An opportunity that can be further explored is community ecotourism. The community is well-positioned for success in this venture, as it has a good infrastructure, along with access and walking trails through the Brazil nut forest, which offers exquisite scenic beauty.

The cooperative can access public resources such as the Food Acquisition Programme[7] and the National School Feeding Programme.[8] Brazil nut biscuits could be supplied to the schools of the RDSI, the surrounding areas and the municipalities close to the reserve.

2.11. Partnerships

Partners of COMARU operate across various lines of action. The Organization of Brazilian Cooperatives and the Brazilian Support Service for Micro and

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[7] For more information please visit https://www.gov.br/mds/pt-br/acoes-e-programas/inclusao-produtiva-rural/paa

[8] For more information please visit https://www.gov.br/fnde/pt-br/acesso-a-informacao/acoes-e-programas/programas/pnae

Small Businesses provide support through training programmes focused on business management, production control and packaging registration, ensuring the traceability of operations.

The Iratapuru Fund has also been an important partner, evaluating local needs and demands. During the COVID-19 pandemic, the BioRio Association drafted a project for the Iratapuru Fund and distributed basic food baskets and hygiene materials to residents.

The SEMA/AP acts as a partner both in the management committee of the Iratapuru Fund and for guidance on environmental regulations, as well as in the preparation, review and monitoring of the management plan and the supervision of the reserve and its surroundings.

Natura continues to be the primary business partner, but COMARU has also been approached by exporting companies such as 100% Amazônia,[9] located in Belém, which has expressed interest in signing a contract with the cooperative.

2.12. Innovation, recognition and outreach

Mainly in Amapá, but also throughout the Amazon, COMARU has influenced public policies and regulations related to the Brazil nut value chain. One of the cooperative's innovations is the processing of raw material into oil, a complex activity for traditional communities that may lack electricity, drinking water, machinery and internet access. Currently, COMARU is among the few community enterprises in the Amazon that maintain an agroindustry and generate decent income for its members. It has also maintained FSC forest management and chain of custody certification for a long time, which is something difficult even for large companies (Instituto Terroa, 2021).

In 2020, COMARU won the first photographic contest “Through the lenses of Amapaense cooperatives”, organized by the Organization of Brazilian Cooperatives, which is a source of pride for the cooperative. That same year, the cooperative launched terms of reference to recruit those interested in implementing an agroindustry revitalization project called Community Industry in the Amazon (COMARU, 2020). Project activities will include the production of cookies, flour, dried walnuts and Brazil nut oil. The new industry is expected to increase and stabilize production volume by purchasing raw materials from affiliates.

3. KEY LESSONS LEARNED

- Training in forest management from the outset of the cooperative’s creation shaped a generation of extractivists concerned with the community’s environment and forest conservation, without which there would be no income from the sale of Brazil nuts.
- Forest certification was a process that professionalized the cooperative, providing knowledge and lessons on forest management techniques, such as not collecting all the fruits in order to allow the soil seed bank to form, as well as formalizing contracts with extractivists.
- It was advantageous to establish a fixed price with the company purchasing the nut oil above the amount paid by intermediaries.
- Providing advances to extractivists was critical in enabling them to purchase inputs and support their families during the collection period. The next step is to diversify the clientele, bearing in mind that the cooperative does not absorb the full production of all members.
- Maintaining traditional practices (e.g. regulated Brazil nut harvesting, formation of a soil seed bank) has mitigated the impacts of the hydroelectric power plant and climate change on Brazil nut tree productivity.
- Inter-institutional coordination, mainly with the private sector, has helped the cooperative

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[9] For more information please visit https://100amazonia.com/

remain active and maintain regular contracts over the years.

- Strengthening of organizational management and territorial governance with the support of institutions has provided important benefits for families, such as health posts, schools and spaces for cultural exchange and recreation.
- The restructured Iratapuru Fund is making it possible for young people to continue their studies, whereas pursuing education was impossible for the first generations of Brazil nut extractivists.

4. FUTURE OUTLOOK

The main objectives of COMARU are to revitalize and expand the agroindustry through product diversification and access to new markets, increasing family income and creating employment opportunities with decent working conditions.

At the moment, there are no prospects of access to markets for payment for environmental services. Regaining FSC certification could be an opportunity, with the enhanced financial sustainability of the venture and access to more working capital.

The cooperative should seek alliances with universities and research centres to find solutions to the socioenvironmental needs and impacts, and to develop research for the valuation of ecosystem services in the area. The cooperative could also coordinate strategically with intersectoral support networks.

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LATIN AMERICA AND THE CARIBBEAN

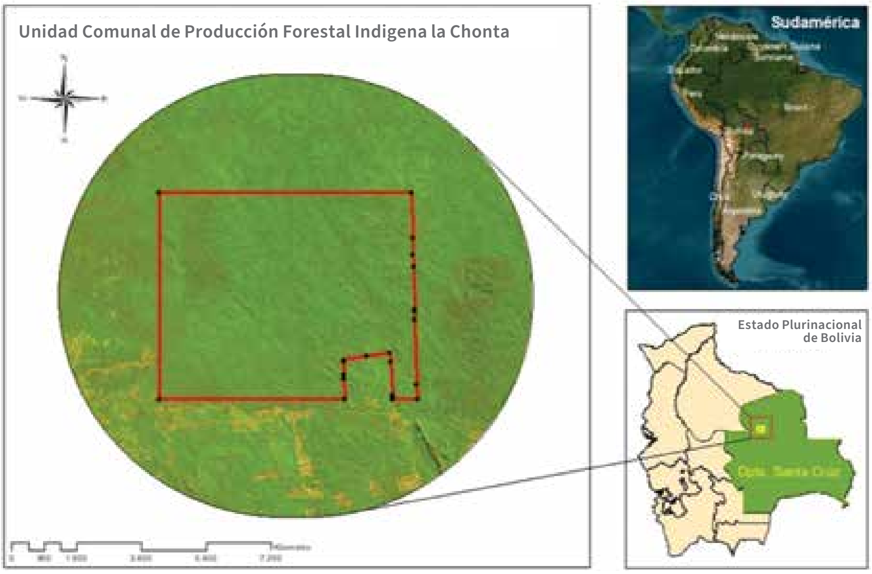
THE ONGOING STRUGGLE BETWEEN ECONOMIC INTERESTS AND SUSTAINABLE FOREST MANAGEMENT IN LA CHONTA, THE PLURINATIONAL STATE OF BOLIVIA

Eduardo Sandoval Hurtado, Universidad Autónoma Gabriel René Moreno

NAME OF FOREST	**La Chonta**
LOCATION	**Municipality of Urubichá, Province of Guarayos, the Plurinational State of Bolivia**
AREA (ha)	**90 138**
MANAGING ENTITY	**Central Organization of Guarayos Native Peoples**
MANAGEMENT OBJECTIVES	**Timber production**
FOREST TYPE	**Natural subtropical humid broadleaf forest**

The Plurinational State of Bolivia, a South American country with a large expanse of relatively undisturbed tropical forests, is among the most biologically diverse nations in the world. Starting in 1997, the state actively promoted sustainable forest management within the framework of the Forest Law 1700, which established prescriptions to ensure the sustainability of forest management and granted access to forestland for private sector actors and indigenous and farming communities.

Figure 1. *The location of La Chonta concession in the Plurinational State of Bolivia*


Unidad Comunal de Producción Forestal Indigena la Chonta
Sudamérica
Estado Plurinacional de Bolivia
Dpto. Santa Cruz

Images: © Google Earth, 2024

Source: Author’s own elaboration; Google. n.d. Google Earth. [Cited 18 December 2024]. https://earth.google.com/web
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

In 2005, the Plurinational State of Bolivia became the global leader in certification of natural tropical forest with 2.1 million ha of native forest certified under FSC (Fredericksen, 2000; De Urioste *et al*., 2010; Vicente *et al*., 2017).

The company La Chonta Woods has been managing the forest concession of the same name in the department of Santa Cruz, Guarayos Province, since the 1970s. For almost 20 years, the company was an icon of good forest management in the Plurinational State of Bolivia, supporting a series of widely publicized silvicultural and ecological research. The company closed operations in 2015, two years after the concession was transferred to the Central Organization of Guarayos Native Peoples (Central de Organizaciones de los Pueblos Nativos Guarayos, COPNAG), which brings together the communities of the Guarayos people.

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2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The first version of the forest management plan (FMP) of La Chonta, developed in 1998, set out objectives to achieve economic profitability and maintain the productive capacity of the forest. These objectives were to be achieved through the management of natural regeneration and other silvicultural prescriptions established by the Forest Law 1700.

In subsequent versions of the FMP in 2014 and 2020, a social dimension was added to the production objective to strengthen indigenous governance of the Guarayos native community lands (*Tierras Comunitarias de Origen*, TCO). This modification took place in 2013, when the administration was transferred to COPNAG.

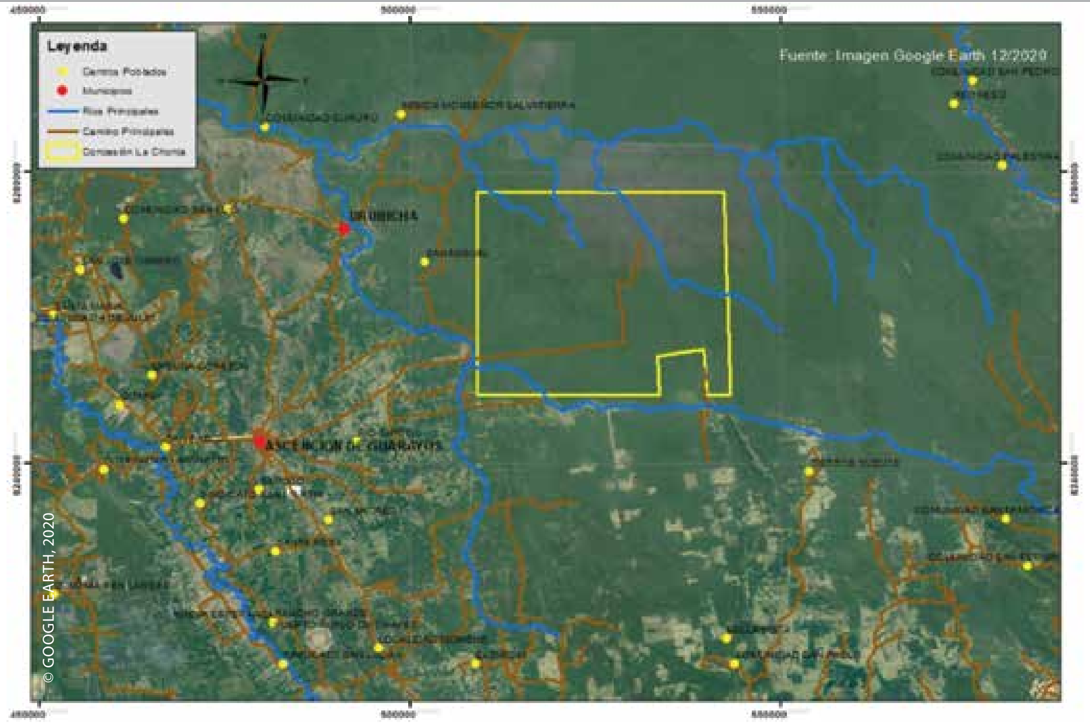
2.2. Type and condition of forest and scale of operation

The La Chonta forest management unit (FMU) is located 31 km northeast of the town of Ascensión de Guarayos, in the department of Santa Cruz. The forest has been classified as subtropical humid with large-dimension timber trees. Almost 50 percent of the trees are deciduous, with heights between 20 and 30 m and emergent trees up to 42 m tall. There is an estimated density of 368 trees above 10 cm diameter at breast height (DBH) comprising 59 species per ha. Lianas are abundant and dominant in disturbed areas, with 70 percent of the trees having lianas (Woltmann, 2000; Mostacedo *et al*., 2008).

The forest of La Chonta FMU can be classified into two types: high-density forest and low-density forest. In the high-density forest, trees reach heights of 25 to 35 m, with *bibosi* (*Ficus* sp.), *verdolago amarillo* (*Terminalia oblonga*), *ochóo* (*Hura crepitans*), *yesquero blanco* (*Cariniana* sp.) and *blanquillo* (*Ampelocera ruizii*) being the most

Deforestation for growing crops inside the La Chonta FMU

Figure 2. *Satellite image of La Chonta concession landscape showing deforestation and forest degradation within and around the concession*



Source: Google. n.d. *Google Earth*. [Cited December 2020]. https://earth.google.com/web
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

common species. The low-density forest has similar species composition as the high-density forest, but with smaller trees of 15 to 25 m in height due to soil conditions and recurrent forest fires in some places (Vicente *et al*., 2017). Most (79 percent) of the area is dedicated to timber production and the rest to protection, natural recovery and other uses.

Forest condition in and around La Chonta changed drastically over the last 20 years, with tree cover loss and reduction in timber volume due to overharvesting, fires, encroachment and land conversion to agriculture (**Figure 2**).

2.3. Legal status and management structure

La Chonta Woods began operations in 1974, when the state granted it two long-term (25-year) forest exploitation contracts (IBCE, n.d.)[1] In 1997, these contracts were converted into forest concessions under the new Forest Law 1700. That same year, with the new National Institute of Agrarian Reform (Instituto Nacional de Reforma Agraria) Law 1715, land regularization began, with territories historically occupied by Indigenous Peoples recognized and titled in their favour. The Guarayos people were one of the first to apply, claiming a territory of more than 1 million ha. At that time, private properties and forest concessions, such as La Chonta, were excluded from the land regularization process.

Initially, the National Institute of Agrarian Reform immobilized 2.2 million ha as regularized area for the Guarayos people, recognizing a priori an initial surface of 551 003 ha as TCO. In 2009, the National Institute of Agrarian Reform granted[2] the ownership right to the La Chonta concession in favour of Guarayos TCO (Vargas, 2020).

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[1] Lago Rey (120 000 ha) and La Chonta (100 000 ha)

[2] Through resolutions of RADT-ST No. 208/2006 and RA-ST No. 0190/2009

The regularization process lasted 25 years (1996–2021), eventually titling a territory of about 1.34 million ha.

La Chonta Woods appealed before the Agrarian Court of the Plurinational State of Bolivia, but the state ratified the right of the concession in favour of Guarayos TCO.[3] Subsequently, in March 2013, the Authority for the Supervision and Social Control of Forests and Land (Autoridad de Fiscalización y Control Social de Bosques y Tierras, ABT)[4] revoked the concession right previously granted to the former La Chonta concession. Since then, COPNAG has acquired the legal right of possession. Rather than dividing the FMU among the communities, as was the prevailing social demand, COPNAG opted to maintain it under forest management.

That same year and against all odds, La Chonta Woods and COPNAG signed an agreement to give continuity to La Chonta FMU. Before ABT, the six community centres of the Guarayos people, the Confederation of Indigenous Peoples of Bolivia and COPNAG formalized the agreement. The company would continue to operate exclusively in the FMU but would pay the new owners of the area by volume of wood extracted. In 2014, COPNAG submitted a new management plan to ABT[5] on behalf of the La Chonta Indigenous Forestry Production Communal Unit, which was approved over an area of 90 138 ha.

However, the agreement did not last long as difficulties arose with the accumulation of uncut harvesting areas pending approval of the updated 2014 FMP. In that same year, COPNAG decided to revoke La Chonta Woods' exclusive harvesting rights. Since then, the annual harvesting area has been divided into three compartments: 800 ha for La Chonta Woods and two others sold each year to the highest bidder. Finally, in 2015, La Chonta Woods ceased operations due to the loss of markets and the constraints of the new situation. The contract for the use of its 800-ha forest area was reassigned to the company SOBOLMA Ltda., which continues to operate under the same conditions to this day.

2.4. Regulatory environment and government support

Law 1700 reformed the old forestry regime of 1974, which had collapsed due to corruption and lack of control over forest activities. The new forestry regime of 1996 established the Forestry Superintendence and with it the implementation of revolutionary measures, introducing the management plan as a tool to guarantee sustained forest production. For the first time, the forestry institution earned the respect of society for its transparency.

The previous system of long-term logging contracts for large areas was replaced by forest concessions granted for 40 years. The number of logging companies decreased from 87 to 66, with the area managed by them reduced from 20.7 to 5.6 million ha (De Urioste *et al*., 2010).

The government at the time strongly supported forest management and gave guarantees to forestry companies so they could apply their management plans and plan for the long term. International cooperation, led by the United States Agency for International Development (USAID), financed numerous investigations through the Bolivia Sustainable Forest Management Project (2005–2007),[6] laying the technical and scientific foundations for the development of forest management.

In 2009, the Plurinational State of Bolivia experienced important social and political changes, including the modification of the state's political constitution. The Forestry Superintendence was transformed into the ABT, causing the forestry institution to lose its technical and political independence and to come under the Ministry of Environment and Water. In this way, the forestry sector once again became highly politicized and quickly lost its social credibility.

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[3] Through National Agrarian Judgment S2a No. 02/2007 and National Agrarian Judgment S2a. No. 30/2010

[4] Through Administrative Resolution No. 88/2013

[5] Through ABT Administrative Resolution No. 129/2014

[6] For more information please visit https://pdf.usaid.gov/pdf_docs/Pdaca610.pdf

In 2010, Supreme Decree No. 726 converted all concessions into Special Transitory Authorizations, with no defined period, generating insecurity among forest stakeholders.

2.5. Forest management practices

The productive forest area of La Chonta FMU is 71 200 ha; the remaining 18 938 ha are designated for protection, natural recovery and other land uses, such as roads and camps. Each year, the annual harvesting area is defined, and commercial censuses are carried out to form the basis for the annual forest operational plans. The ABT authorizes the forest use according to these plans (Vicente *et al.*, 2017).

In the FMP updated in 2014, silvicultural prescriptions of the previous plans were maintained and continue to be applied, with an increase in the harvested species from 10 to 18. The most important change was the reduction of the cutting cycle from 30 to 20 years, and an increase in annual use area from 2 373 ha to 3 559 ha (Vicente *et al.*, 2017). The annual harvest was estimated to be 47 535 m^3, which corresponds to 23.23 m^3/ha. Measures to ensure sustainability of harvested trees include a minimum cutting diameter of 50–70 cm and prescribed cutting intensity of 60 or 80 percent, depending on the species. Enrichment is usually not carried out.

Other than harvesting, no silvicultural practices are currently being applied. Harvested areas are left without any treatment once harvesting is completed. However, SOBOLMA does apply reduced impact logging techniques, marks and retains seed trees, and cuts vines, among other practices.

The following references from relevant studies carried out in the concession provide insights into the impacts of forest operations in the years before the administration passed to COPNAG:

- Krueger (2003) found that skid trail planning prior to logging significantly reduced damage to future harvest trees from skidder passage. Similarly, marking future harvest trees reduced damage by 20 percent. Currently, such practices are only applied in the SOBOLMA area.
- Jackson *et al.* (2000) found that the harvesting altered 46.3 percent of the forest, including disturbances in 25 percent of the soil surface through skid tracks, logging roads and storage yards, in addition to a 25 percent opening of the canopy due to tree felling. On average, 44 trees were damaged for every tree removed, 22 of which were killed or seriously damaged.

Truck-loading in a log yard in 2023

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The Bolivian Institute for Forestry Research installed large permanent experimental plots (320 ha) in La Chonta and monitored them for three years, applying three logging intensities (Mostacedo *et al.*, 2008). The results showed that natural recovery of the forest becomes difficult after high intensity logging as the impact of harvesting extends for years afterwards.

2.6. Production and business aspects

The forest inventory in La Chonta in 2012 found 131 forest species with a DBH ≥ 20 cm, including palm trees. Of this total, only 18 species were considered for harvesting. Compared to the inventory data from 1998, there was only a slight decrease in abundance, but a greater decrease in both basal area and volume (**Table 1**). The decrease in these parameters can be attributed to timber extraction during the 14-year period as well as to forest fires in the southern part of the concession (Hurtado, 2014). The reduction of timber volume by half provides compelling evidence of over-harvesting and the unsustainability of forest production during this period.

Table 1. *Forest inventory parameters in 1998 and 2012*

DESIGNATION	1998	2012	REDUCTION
Abundance (No./ha)	87.9	80.7	8.2%
Basal area (m^2/ha)	13.7	6.9	49.0%
Volume (m^3/ha)	66.6	34.3	48.5%

Source: Hurtado, R. 2014. *Plan General de Manejo Forestal Comunitario Indígena "La Chonta" TCO Guarayos.* Santa Cruz, Bolivia.

From the beginning, La Chonta Woods had a sawmill installed on its own land, next to the La Chonta FMU, where logs were transformed into sawn wood and then transported to the furniture factory in the city of Santa Cruz de la Sierra. The sawmill ceased operations in 2018. Currently, all the wood is sold as standing trees and each buyer transports the logs to sawmills located in the city of Ascensión de Guarayos. It is worth mentioning that La Chonta Woods used to export FSC-certified products (doors, frames, furniture, beams, mouldings and sawn wood) to 20 markets around the world (IBCE, n.d.).

Another change has been a progressive substitution of durable high-value species (that are increasingly short in supply) by less durable wood species, such as *ochóo* (*Hura crepitans*), *serebó* (*Schizolobium parahyba*) and *hoja de yuca* (*Ceiba* sp.), among others. This has resulted in a higher volume removed per hectare compared to previous years.

Harvesting costs are currently around USD 20/ha. The sale price of standing timber is between USD 10 and USD 12/m^3 for higher-value species, and USD 8 to USD 10/m^3 for less valuable species.

Harvested logs labelled to ensure traceability

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2.7. Social aspects and impacts

Vallejos (2009) reports that around 67 forest companies operated within the Guarayos TCO, directly bringing economic benefits through the purchase of standing timber and the provision of employment opportunities for the indigenous population. However, the presence of forest companies also led to deforestation through the opening of roads, as well as territorial conflicts and changes in the Guarayos culture. Vallejos' study also recognizes the opportunities for rural poverty reduction in communities that have ventured into establishing community forestry companies to manage their own forests.

When the company La Chonta Woods administered the FMU, it generated 150 jobs directly and the same number indirectly. It also activated the local economy with the hiring of transport, procurement of food services, and purchase of meat and other food from local suppliers. The company's contribution to the socioeconomic development of the region was notable, in addition to its reinvestments in the industry. It also supported neighbouring communities with donations for sports, health, culture, education and road infrastructure, as well as donations of sawmill equipment (IBCE, n.d.).

The company's forest personnel began to decrease in 2014 in response to the reduction in harvesting area from 2 500 ha to 800 ha, while the number of jobs in the sawmill were maintained until 2018, when it closed operations. Currently, each operator brings its own staff, some of whom are from Guarayos and others from elsewhere.

At the end of each harvest, COPNAG distributes the profits equally among the six community centres that make up COPNAG. Each centre decides on the usage of the funds, which generally cover administrative expenses. None of the centres reinvest money in harvest planning since this is covered by the buyers who carry out the forest census and prepare the annual forest operational plan for ABT approval.

2.8. Environmental values and impacts

La Chonta FMU was certified by FSC from 1999 to 2011 while under the administration of La Chonta Woods. The certification guaranteed the protection of high conservation values and ecosystem services, including through the prevention of wildlife hunting, application of reduced impact logging, protection of water courses and protection of the forest area against threats from third parties. The certification was cancelled by the company in 2011 when it was notified that the FMU would be administered by the Guarayos people.

Since La Chonta FMU has come under the administration of COPNAG, the only forest activity is annual harvesting by the purchasing companies. The purchasing companies have no responsibility to implement measures to promote recovery of the forest after harvesting.

The most dramatic changes that have been observed in the revisit to La Chonta FMU are the existence of extensive small-scale forest clearings (between 2 and 3 ha) along the interior roads (**Figure 3**). These clearings are being created opportunistically by farmers seeking to access land. Both ABT and COPNAG conduct inspections to identify such occurrences. According to interviews, communities that had previously settled in the FMU and were subsequently evicted by ABT often return to re-establish settlements, continuing the deforestation process.

Groups of these encroachers are forming new "communities" and requesting COPNAG to allocate areas for their use. The FMU has already been demarcated into 50-ha plots for such communities. Even though it is illegal to clear land or create settlements inside the La Chonta FMU, people continue to do so in attempt to establish a presence. The underlying expectation is that, at the end of the cutting cycle, the FMP will be annulled, giving free rein to agricultural use.

Another observed change is that some plot owners are selling land to outsiders who have

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Deforestation for agriculture in the timber production area of La Chonta

advanced towards the Guarayos to buy land for mechanized agriculture, land speculation or forming new communities. These land transactions have led to violent seizures of properties, burning of buses and agricultural machinery, and even persecution of people who oppose these illegal businesses. These buyers are aware of the risk in their investment, as such sales are illegal, and users of the land could be evicted by the competent authority. The Guarayos leaders are publicly accused of selling their land to outsiders, and consequently, COPNAG has lost legitimacy and split into four parallel factions. The sale of TCO land by Indigenous Peoples is a new practice and contravenes the basic rationale of indigenous territories.

2.9. Challenges and threats

The biggest threat identified is forest conversion to agricultural use and the ensuing conflicts. The interviewees indicate that “the days of the forest are numbered; at the most, it will continue to be managed for another five years and then it will become an agricultural area.”

Another threat is the presence of mining concessions exploiting gold and tantalum, granted by the state to mining companies within the FMU. The area’s owners do not exercise social control over the mining activities, so it is unknown whether the activity creates contamination.

2.10. Opportunities

Opportunities exist thanks to the presence of NGOs such as the Bolivian Institute for Forestry Research, which is supporting community forest management activities in the area. Another opportunity lies in the demand for wood from certified companies. If leveraged, this demand could bring favourable commercial agreements, enabling the TCO landholders to manage the La Chonta forest under sustainability and conservation criteria.

2.11. Partnerships

In the Guarayos TCO, communities have formed partnerships with private logging companies. Under contractual agreements, communities with approved FMPs grant private companies the right to use their annual harvesting areas. These companies are responsible for planning and carrying out the logging operations, while the community remains in charge of protecting the area and reporting to the ABT.

The Bolivia Sustainable Forest Management Project and the Bolivian Institute for Forestry Research have developed most of the past research in La Chonta. The Gabriel René Moreno Autonomous University and other universities have also participated in research through bachelor's, master's and doctoral theses.

2.12. Innovation, recognition and outreach

In 2001, WWF awarded the Plurinational State of Bolivia the "Gift to the Earth" award for having reached 1 million ha of forest certified under the FSC, of which La Chonta was a part.

Substantial research has been conducted at La Chonta FMU, generating multiple publications on themes such as forest management, ecology of lesser-known species, forest fires, fauna dynamics and the effect of harvesting clearings on the presence of birds. These investigations have informed policy; for example, in 2006, the former Forestry Superintendency published a directive establishing obligatory silvicultural treatments, based on the studies in La Chonta and other research sites.

3. KEY LESSONS LEARNED

The quality of forest management applied in La Chonta FMU has been one of the best developed models in the country. Research carried out in the area over the last 25 years has allowed the development and dissemination knowledge on forest growth, ecology and dynamics, as well as the economic viability of forest management.

The change of administrator, from a private for-profit entity to a social entity with no long-term interest in sustainable forest management, resulted in a deterioration of forest management and progressive degradation of forest resources, to the point where a large part of the area is threatened with imminent deforestation and land conversion.

The case of La Chonta demonstrates that sustainability is better served when the rightsholder is committed to long-term investment and sound management. The change in leadership to entities driven primarily by economic ambition, with little regard for the forest's sustainability, has even put their rights to the land at risk. Granting tenure to indigenous communities does not automatically guarantee sustainable forest management, and managing a forest for commercial production does not necessarily mean that economic interests will override sustainability considerations.

4. FUTURE OUTLOOK

There is a clear trend towards the conversion of the forest to agricultural use, leaving the FMU with little prospect of continuing sustainable forest management and use.

Key informants confirmed that the La Chonta FMU is perceived as land that is available for the taking and that the FMP is no longer considered valid. It is forecasted that La Chonta will be completely deforested and converted for production of agricultural crops and livestock within five to ten years.

The rest of the forests on Guarayos TCO are expected to face a similar fate due to the intense competition for land access by any means necessary, including the violent subjugation of rightsholders and the bribing of leaders and authorities. This is, without a doubt, the most severe threat to forest management on native community lands in the country.

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MANOA: DEMONSTRATING THE VIABILITY OF FOREST MANAGEMENT IN THE BRAZILIAN AMAZON IN THE FACE OF PRESSURES

César Sabogal, Forest Consultant, and **Herminio Fernandes da Silva Neto**, Manoa Sustentável Exploração e Serviços Florestais

NAME OF FOREST	**Manoa**
LOCATION	**Municipality of Cujubim, Rondônia State, Brazil**
AREA (ha)	**74 039 (total area), 63 877 (certified forest)**
MANAGING ENTITY	**Manoa Sustentável Exploração e Serviços Florestais**
MANAGEMENT OBJECTIVES	**Sustainable timber production; generation of carbon credits; forest conservation**
FOREST TYPE	**Natural tropical humid forest**

1. INTRODUCTION

The company Manoa Sustentável Exploração e Serviços Florestais (MANOA) was established in 1983, following the acquisition of approximately 74 000 ha of forest in the State of Rondônia, in Brazil's western Amazon, by Triângulo Pisos e Painéis Ltda.[1] MANOA is a pioneering case of SFM and was the first company to obtain forest certification in the state, where high rates of deforestation have been recorded for decades and informal and illegal forestry activities have prevailed.

The company's forest is located about 65 km from the city of Cujubim, in the municipality of the same name, and just over 250 km from the state capital, Porto Velho (**Figure 1**). The property is contiguous to Jamari and Jacundá National Forests and the Samuel Ecological Station, forming a large (480 000 ha) block of forest. In addition, it borders rural settlements that have been expanding over the years as part of the agrarian colonization policy.

Forest in the area predominantly comprises lowland open ombrophilous forest and submontane open ombrophilous forest according to Brazilian classification.[2]

From the 1980s onwards, the municipality of Cujubim experienced a boom in logging activity, with more than 60 sawmills operating. The wood, coming mainly from extractivist settlements, was sold as logs or sawn timber in Rondônia and other states. In addition to logging, the base of the economy in the municipality – as well as in the region – has been and continues to be livestock farming, agriculture (mainly for cocoa, cassava and rice) for the local and regional markets, and the extraction of rubber (*Hevea brasiliensis*), açaí palm (*Euterpe oleracea*) and

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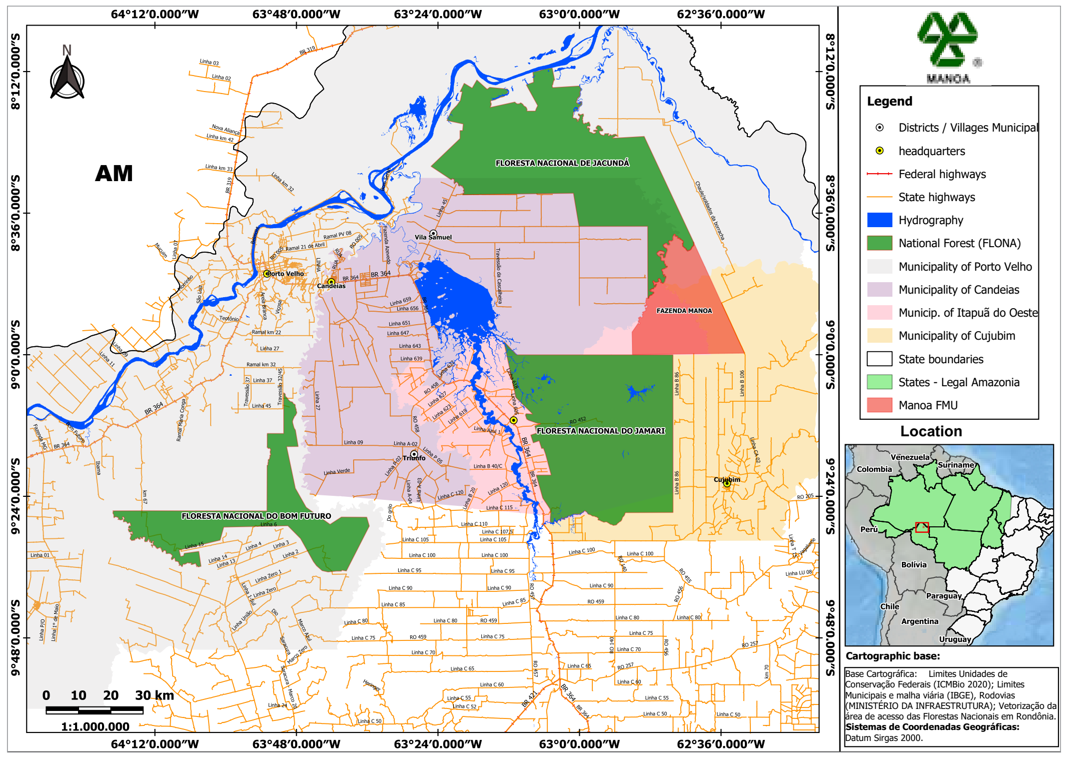
[1] The Triângulo Group (www.triangulo.com.br), headquartered in Curitiba, Paraná, owns forestry projects in the southern and northern regions of Brazil, and has about 2 000 employees working in the production of compensated and laminated wood, sawn wood and flooring. Most of its production is destined for the foreign market.

[2] The most common species that characterize these forest types are *jequitibá* (*Cariniana* spp.), *roxinho* (*Peltogyne* sp.), *faveira* (*Dinizia* sp.), *angelim* (*Hymenolobium* sp.), copaiba (*Copaifera* sp.), *guariuba* (*Clarisia racemosa*), *maracatiara* (*Astronium lecointei*), *jatobá* (*Hymenaea stigonocarpa*), *freijó* (*Cordia goeldiana*), *tauari* (*Couratari* spp.) and *pino cuiabano* (*Schyzolobium amazonicum*).

Figure 1. *Location of MANOA in the municipality of Cujubim, Rondônia State, Brazil*


64°12′0.000″W
63°48′0.000″W
63°24′0.000″W
63°0′0.000″W
62°36′0.000″W
8°12′0.000″S
8°36′0.000″S
9°0′0.000″S
9°24′0.000″S
9°48′0.000″S
N
AM
FLORESTA NACIONAL DE JACUNDÁ
FAZENDA MANOA
FLORESTA NACIONAL DO JAMARI
FLORESTA NACIONAL DO BOM FUTURO
Vila Samuel
Porto Velho
Candeias
Triunfo
Cujubim
0 10 20 30 km
1:1.000.000
MANOA
Legend
Districts / Villages Municipal
headquarters
Federal highways
State highways
Hydrography
National Forest (FLONA)
Municipality of Porto Velho
Municipality of Candeias
Municip. of Itapuã do Oeste
Municipality of Cujubim
State boundaries
States - Legal Amazonia
Manoa FMU
Location
Venezuela
Colombia
Suriname
Perú
Bolivia
Paraguay
Chile
Argentina
Uruguay
Cartographic base:
Base Cartográfica: Limites Unidades de Conservação Federais (ICMBio 2020); Limites Municipais e malha viária (IBGE), Rodovias (MINISTÉRIO DA INFRAESTRUTURA); Vetorização da área de acesso das Florestas Nacionais em Rondônia.
Sistemas de Coordenadas Geográficas:
Datum Sirgas 2000.

Source: Manoa Sustentável Exploração e Serviços Florestais. n.d. Internal document

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

Brazil nuts (*Bertholletia excelsa*). In recent years, soybean monoculture has expanded dramatically.

MANOA's forest management plan was approved in 1994 (MANOA, 2018). In the early 2000s, the company suspended operations for several years because of difficulties of working with forest companies that did not meet the desired standards. After investing in training, equipment, machinery and infrastructure to reorient its production process towards the application of reduced impact management and sustainability precepts, MANOA obtained FSC forest management certification in 2005.[3] The company also certified its entire industrial chain, guaranteeing the origin and traceability of its production. In 2006, MANOA was also certified by the Brazilian Forest Certification Program.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

Industrial wood production has been maintained as the main management objective. The company decided to close its wood processing facilities in 2016, concentrating on forest management and supplying timber to the local market – the Municipality of Cujubim.

Another main objective is forest conservation, and in 2020, the company started generating income from carbon credits generated through a REDD+ project[4] certified under the Verra Carbon Standard. Each year, the company's forest management prevents the emission of 279 290 tonnes of CO_2e, totalling 8.4 million tonnes of CO_2e for 30 years.[5]

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[3] 73 079 ha were certified, with 60 689 ha of effective management for forestry production. The remaining area, equivalent to 14.6 percent of the property, corresponded to protected areas.

[4] Projeto REDD+ Manoá (https://registry.verra.org/app/projectDetail/VCS/1571)

[5] For more information please visit https://www.reddprojectsdatabase.org/view/project.php?id=819

2.2. Type and condition of forest, and scale of operation

The area of forest under management has been maintained over the years, while neighbouring areas to the south, east and north have faced dynamic settlement expansion and the advance of the agricultural frontier. This can be seen in **Figure 2**, which juxtaposes satellite images taken in 2000 and in 2019. The expansion has even affected protected areas, such as the Samuel Ecological Station and the Jamari National Forest.

2.3. Legal status and management structure

The forest area is still owned by the company MANOA Sustentável Exploração e Serviços Florestais. Its organizational structure has not changed, except that it has not had a processing industry in Cujubim since 2016.

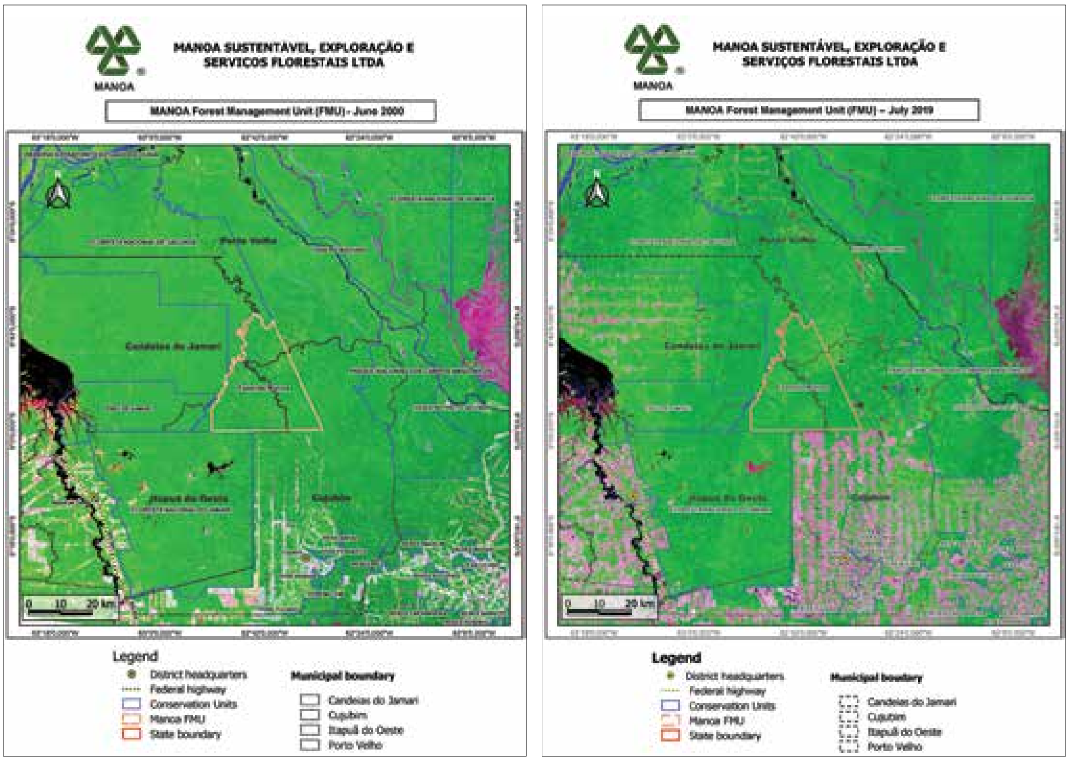
MANOA's forestry operations are conducted largely through two companies contracted for harvesting. In addition, it is advised by a consulting company (STCP Engenharia de Projetos), which provided assistance in preparing for forest certification.

2.4. Regulatory environment and government support

There have been several policy developments that have favoured forest management. Examples include the monitoring and control system that discourage deforestation and illegal timber extraction, and the standardization of wood-scaling procedures. In the case of forestry concessions, regulations became less cumbersome for operators.

MANOA has been contributing to the improvement of forest regulations through regular

Figure 2. *Satellite images of the MANOA property and surrounding areas in 2000 and 2019, showing the considerable expansion of agricultural and settlement areas (in pink)*


MANOA SUSTENTÁVEL, EXPLORAÇÃO E SERVIÇOS FLORESTAIS LTDA
MANOA
MANOA Forest Management Unit (FMU) - June 2000
MANOA Forest Management Unit (FMU) – July 2019
Porto Velho
Candeias do Jamari
Itapuã do Oeste
Cujubim
0 10 20 km
Legend
District headquarters
Federal highway
Conservation Units
Manoa FMU
State boundary
Municipal boundary
Candeias do Jamari
Cujubim
Itapuã do Oeste
Porto Velho

June 2000

July 2019

Source: MANOA Sustentável Exploração e Serviços Florestais. n.d. Internal document
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

Images: © MANOA Sustentável Exploração e Serviços Florestais interactions with government officials. The company has hosted visits of officials to the forest areas and facilities, allowing them to observe the technical innovations, operational practices, and educational and training activities being implemented.

Inventory teams are provided with GPS devices that allow them to operate with cruising trails every 1 000 m during the 100 percent inventory or census, instead of opening trails every 50 m. In addition, the layout of skid yards has been changed from 20 x 25 m to 12 x 40 m, which facilitates the transport of logs and makes the operations more efficient.

MANOA has also played a role in improving the implementation of the Authorizations for Forest Exploration (AUTEX) by advocating for a more flexible approach. Previously, the rigid application of AUTEX required companies to predetermine which trees to harvest each year, resulting in heightened forest impact.[6] In response, the Secretary of State for Environmental Development (Secretária de Estado do Desenvolvimento Ambiental) in Rondônia enacted a regulation[7] allowing companies that met certain conditions to qualify for "full AUTEX." This designation permits them to harvest the total volume specified in the forest inventory, affording them the liberty to select trees within that limit. Consequently, companies now have the flexibility to exclude species that lack a viable market in a given year.

2.5. Forest management practices

When the processing industry closed in 2016, the company turned its resources entirely to forest management, and, in 2018, it decided to carry out the harvesting operations itself instead of outsourcing them. Since then, MANOA has improved the quality of its operations, over which it now exercises greater control. These changes led to an increase in wood production from 35 000–40 000 m^3 per year to 50 000–60 000 m^3 per year. The company had to invest in the purchase of timber extraction equipment, but the overall operational costs are less compared to contracting third parties. MANOA has a high-quality forest management plan thanks to advice received over the years from a specialized company (Brasil Florestal), based on analysis of data from forest inventories and permanent sample plots.

Key practices or measures that contribute to the quality of management and improved harvesting operations include the following:

- Detailed planning of operations starts the year before harvesting and is flexible enough to accommodate unforeseen operational as well as natural circumstances.
- The main logging roads are constructed one year before harvest, while secondary roads are opened during the harvest to avoid complications caused by heavy rain, which can hinder the operation of machinery.
- Although the minimum cutting diameter is 50 cm, forest inventory in the annual production unit includes all species above 35 cm in diameter in consideration of market variations (which define which species can be harvested) and silvicultural considerations (to better understand the population structure and productive capacity for the next felling cycle). On average, 70–75 percent of the trees marked for harvesting are cut, always keeping the extraction volume below 25 m^3 per hectare. In the annual production unit 11 (2022/2023), 32 species were harvested out of 97 species inventoried.
- A disciplined work schedule is followed that includes a defined daily production target (15 to 20 trees harvested per day, 80 to 100 m^3 of wood extracted per operator, with skidder capacity of 600 m^3 per day).

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[6] In 2009, wood production was approximately 20 000 m^3 per year, distributed among 27 species, which represented only 4.7 to 6.8 percent of the total forest volume. The logs were transported from the forest to the MANOA processing facility in Cujubim. That industry consumed only six species, and the remaining 18 were sold as logs to other logging companies in the region.

[7] Portaria No. 087/GAB/SEDAM

Top: A chainsaw operator felling a large tree in accordance with established guidelines

Bottom: A well-maintained main logging road to access annual production unit

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- Safety is highly valued and there have been no fatal accidents throughout MANOA's operations.
- The chainsaw operator has a GPS unit with a map indicating the locations of harvest trees, seed trees, rare tree species, trees for future harvest, and trees close to permanent protection areas and their buffer zones. The crew registers the felling direction and the direction in which to skid the trunks.
- Chainsaw operators make the final decision regarding the tree to be felled depending on factors such as the actual diameter, the presence of holes or deformity in the trunk, and the likelihood of causing collateral damage to residual trees around the harvest tree.

Road and bridge maintenance is the main post-harvesting operation. Harvesting is conducted with the least possible impact on the remaining tree population. Therefore, there is good potential for natural regeneration, and no post-harvesting silvicultural treatment is conducted.

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To protect the forest area, there are surveillance posts in two critical sections of the forest management unit boundaries. Surveys are conducted approximately every 20 days. If any irregularities are detected, authorities are informed. Encroachment or unauthorized access is practically non-existent in the area. This is attributed to MANOA's long-standing policy of forging effective partnerships with the community and local stakeholders. The company has the necessary firefighting equipment; to date, there have been no problems with fires.

The monitoring system established by MANOA addresses operational activities and their impacts. Through standardized procedures and records, operations are constantly monitored, and the company can respond quickly to situations that require corrective measures.

MANOA has established permanent sampling plots to monitor all trees above 10 cm in diameter at breast height. Since 2014, ten sample plots have been installed as part of the company's REDD+ project, and another 36 plots are about to be installed to include increment measurements. Results to date indicate that the forest increment is much greater than 0.86 m^3 per hectare per year, which is the annual productivity for the group of commercial species.

2.6. Production and business aspects

MANOA currently produces 45 000–60 000 m^3 of timber per year, which is sold to some 20 companies in the local market in Cujubim. The supply of wood to the local industries is part of the company's policy to generate employment and benefits for the municipality and its inhabitants. Part of the sawn wood is sold to Triângulo Pisos e Painéis Ltda., which exports it with high added value.

Timber traceability is well-established, with clear procedures for recording and identification. The existing volume of wood by species is always known both in the different logging yards and the main yard. The staff at the office in the main yard have satellite internet and work with a digital system developed for MANOA and interconnected with the Documento de Origem Florestal (Document of Forest Origin). The records detail the entire chain of custody and the specifications of the wood that is shipped for each client.

Though the wood produced by MANOA is certified, local buyers are only interested in the guarantee of legal origin and not the SFM certification. The FSC certification does not result in price premium but gives the company credibility and respect. It also

Logs being transported to the main logyard on a truck

©CÉSAR SABOGAL

©CESAR SABOGAL

Dormitories for employees at a permanent forest camp

serves as a tool to "discipline itself" to maintain operational quality and sustainability standards.

A recent difficulty for the company's business arose with the listing in the Convention on International Trade in Endangered Species of Wild Fauna and Flora[8] Appendix II of two commercially important Amazonian hardwoods, *cumaru* (*Dipteryx* spp.) and *ipê* (*Handroanthus* sp., *Tabebuia* sp.), which are highly valued as flooring wood and for outdoor use. The sales of these species have been affected as a result. All Triângulo clients have suspended the use of *cumaru*, and forest operators will probably have to stop extracting them due to restrictions they already face in the European market.

Sometimes, uncertainty in species identification generates problems in ensuring legal compliance and marketing of diverse timber species. MANOA is now considering hiring botanists to ascertain species names during forest inventory, which will increase costs. Avoiding the use of new, under-utilized species to circumvent this issue has implications for the management model, which endeavours to alleviate the pressure on species that have higher commercial demand by reducing their exploitation intensity.

2.7. Social aspects and impacts

MANOA directly employs 50 to 60 people, all from Cujubim, and generates 500 jobs in the municipality. It is estimated that some 800 families depend on the company.

Most of the operating personnel are rehired from one harvest season to another. There is a certain loyalty to the company, since MANOA pays well above the average for the region and has a policy of appraising employees, promoting continuous improvements in the functions they perform, and enabling them to grow within the company.

All employees receive annual training courses on occupational health and safety, firefighting and prevention, and reduced impact use, among others. In addition, new personnel are trained in situ by the same experienced operators, which provides an effective process for assimilating good practices and operational skills.

MANOA provides lodging, food, life insurance and transportation for its employees. During the week, field personnel stay in the permanent camp in the forest which has solar panels, fuel, internet, a health post, television and other services and amenities. Personnel travel by bus from the work area to the camp (about 60 km); on weekends they are transported to Cujubim to be with their families.

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[8] For more information please visit https://cites.org/sites/default/files/eng/cop/19/prop/as_received/E-Dipteryx_spp.pdf.

The company has been supporting various social activities in the municipality from the outset. These include schools (e.g. the Raio de Luz Municipal School for Early Childhood Education), healthcare (e.g. the Mobile Care Service Emergency Department), sports and recreational activities, church, and local groups. In the last two years, MANOA's support to education, culture and recreation has benefited nearly 400 children and young people.

2.8. Environmental values and impacts

The damages and impacts from harvesting are monitored in each harvest season. According to the monitoring reports for the last six annual production units, harvesting operations impacted around 12 percent of the total forest management area.

Medium-sized and large mammals that inhabit the region are being monitored under a 2015 agreement with the University of Rondônia. Monitoring reports indicate the regular presence of these mammals in harvested areas following a period of pause in operations.

Nest trees, endemic species and species prohibited for exploration are monitored on an annual basis. Reports indicate full compliance with measures to avoid damage to these resources as well as the permanent protected areas.

2.9. Challenges and threats

The primary challenge facing tropical forest management today is the absence of a robust market for tropical wood products. This issue is exacerbated by the growing misconception in the country that logging in natural tropical forest is a significant driver of deforestation (e.g. Lentini *et al.*, 2022). Regrettably, as demand dwindles, so does the capacity to safeguard these vital forests and recognize their intrinsic value.

In the last decade, the number of sawmills operating in the municipality has decreased from 60–70 to barely 30. This reduction was due to the growing scarcity of wood in Cujubim as well as the enormous pressure to comply with harvesting regulations. Many forest producers sold their management area after harvesting, arguing that they could not wait the mandatory 30-year cutting cycle. These areas were ultimately deforested. During this period, a commodity boom, such as for soybean, encouraged the transformation of forest land into agriculture.

Operational planning is also being affected by changing rainfall patterns, which are shifting towards less precipitation and greater unpredictability.

2.10. Opportunities

There are opportunities for MANOA linked to an increased demand for quality wood of legal origin to supply the domestic market, with policies and measures that effectively promote SFM and forest certification in the Amazon.

Encouraging the improvement of forest management, especially in terms of making it more sustainable and more economically attractive compared to other land uses, includes not only improving management practices currently being employed but developing markets for a broader

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*A jaguar (*Panthera onca*) photographed by a camera trap in a recently harvested unit at MANOA*

MAPA DE EXPLO...
Faixa 325

A smartphone mapping application showing the locations of all commercial trees in a harvesting area

©CESAR SABOGAL

range of usable species, primarily for what we now call lesser-known species. This matter should also include initiatives aimed at the multiple uses of the forest and the use of residues and other by-products generated by the industry, which are rarely used today (Valdiones *et al*., 2022).

Forest management for carbon is recent, and the rules of the game and the market itself are not yet consolidated. MANOA does not consider carbon as the main income source, but rather as a complement.

2.11. Partnerships

MANOA has developed a solid reputation as a serious and committed company. There is no encroachment onto the company land despite it being in an area with expanding agroextractivist settlements, indicating that people value the benefits the company generates. The business policy was and is to have partnerships with the community.

The company also has good relations with environmental agencies at the municipal, state and federal levels, for example the Secretary of State for Environmental Development, Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade) and the Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis), as well as with clients, researchers and educators.

2.12. Innovation, recognition and outreach

MANOA has introduced several innovations at both the managerial and technical levels – as described in Sections 2.5 and 2.6. The company's long-term relationships with various key actors, as well as its educational, transfer and training activities, enable MANOA to share its experiences and good practices, thus disseminating the benefits of SFM.

In 2014, MANOA established a forestry education centre in line with the company policy of sharing experience and promoting technical exchange. Between 2008 and 2017, MANOA promoted 37 activities for different sectors, directly benefiting 362 people, including students and professionals. Today, 100 to 200 people visit this centre every year, including clients, government officials, auditors and researchers, as well as representatives of universities and municipal schools.

MANOA has developed its own computer system to control inventory, logging operations and sales, thus reducing waste and increasing efficiency of operations.

The company has been acknowledged by certification entities (FSC, Certified Carbon Standard and Programme for the Endorsement of Forest Certification) for its responsible forest management practices.

3. KEY LESSONS LEARNED

- Good relations with communities, authorities at different levels, clients, academia, educators and organized civil society in general contribute to making visible the benefits and sustainability of SFM.

- The responsible management of the forest to sell logs of commercial species at the local level can be profitable in the Brazilian Amazon, generating jobs and contributing to well-being.
- A business vision and policies that prioritize forest sustainability, management quality and social commitment must first be appropriated by the employees themselves, who recognize and embrace the company's heritage and the values and standards that guide it.

4. FUTURE OUTLOOK

In the current context, the future of SFM in the Brazilian Amazon is uncertain. First, there is common misconception about what forest management is, not only among policymakers but also among government officials and civil society actors. Second, government policies tend to encourage forest conversion to agriculture and livestock (agribusiness). "Today a hectare of forest is worth Brazilian real (BRL) 1 000 to 3 000, while a deforested area is worth BRL 40 000 to 50 000", said Murilo Granemann, Sales Director at Triângulo Group. Furthermore, illegal logging and trade in illegal timber are big obstacles to making SFM viable in the Amazon.

The demand for legal timber – coming from forests that are managed in compliance with the legislation – will continue to increase in the region, although changes are expected in the composition of the main commercial species. On the other hand, the carbon business is not yet consolidated, with uncertainties about methodologies, conditions and modalities for transactions.

MANOA has a keen eye towards the future, strategizing for optimal methods that will contribute to safeguarding and enhancing the value of the forest in the long term. With its vision, business policy and transparent operations, MANOA wants to demonstrate that managing for timber and eventually carbon capture can make SFM viable, but the evidence must be brought to public decision makers, investors and producers.

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PROMOTING FOREST ECOSYSTEM CONSERVATION AND THE VISION OF *KÜME MOGEN*: THE CASE OF MAPU LAHUAL TERRITORY, CHILE

Leonardo Durán Gárate, Universidad Mayor, Chile

NAME OF FOREST	**Mapu Lahual and Lafken Mapu Indigenous Parks Network**
LOCATION	**Communities of San Juan de la Costa, Río Negro and Purranque, province of Osorno, Chile**
AREA (ha)	**62 000**
MANAGING ENTITY	**Indigenous community association Lafken Mapu Lahual**
MANAGEMENT OBJECTIVES	**Multiple-use; production from dead wood and non-timber forest products; ecosystem conservation; community-based ecotourism**
FOREST TYPE	**Temperate humid broadleaf forest, locally known as Selva Valdiviana**

1. INTRODUCTION

The Mapu Lahual territory is located within the communes of San Juan de La Costa, Río Negro and Purranque in the Los Lagos Region of Chile (**Figure 1**). It covers an approximate area of 62 000 ha, 90 percent of which is occupied by temperate coastal laurel forest and coastal resinous forest vegetation communities (Luebert and Pliscoff, 2018).

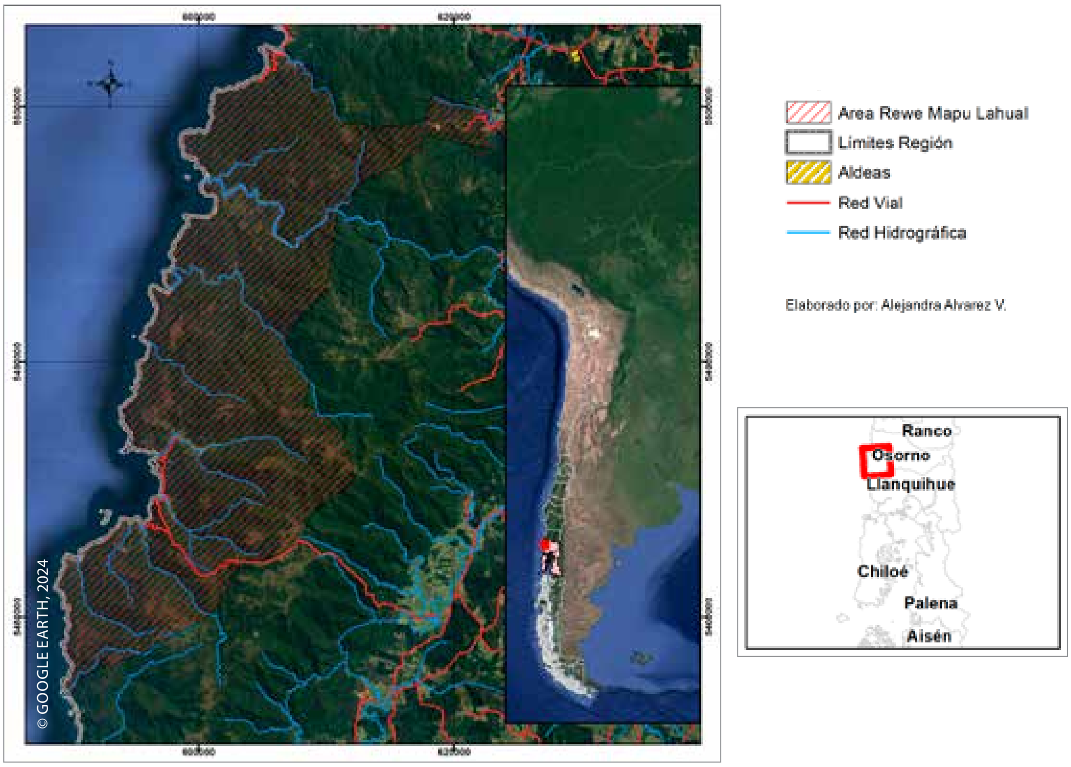
Among the diversity of endemic species of flora and fauna, alerce (*Fitzroya cupressoides*) is dominant. This tree can reach up to 50 metres in height and live for more than 3 600 years (Lara and Villalba, 1993). Alerce was declared a Natural Monument by Decree No. 90/1976, which prohibits its felling and regulates the extraction of dead wood.

The territory has a population of almost 1 200 people across nine Mapuche-Williche communities, who have traditionally used the diverse resources of the forest and coastal ecosystem to meet their needs for food, medicine and construction materials. These communities – Caleta Cóndor, Maquemapu, Hueyelhue, Ñirehue, Loy Cumilef, Melillanca Guanqui, Maicolpi, Maicolpué Río Sur and Lafken Mapu – are part of the Mapu Lahual Indigenous Association. They have been working since 2001 to promote and diversify sustainable economic activities based on both ecosystem goods (e.g. timber and NTFPs) and services (e.g. sightseeing).

The Mapu Lahual Indigenous Parks Network serves as a geographical, social and cultural space for forest conservation and for the preservation of the traditions and customs of the Mapuche-Williche communities (McAlpin, 2008).

In the area, a link between the communities and the use of dead alerce-wood is particularly notable (Muñoz, 2012). This connection derives from the worldview of the communities in this coastal mountain range and is expressed at the individual and family levels in their interactions with the environment and the species itself. Activities such as unearthing the tree and producing wood tiles or shingles (*tejuelas*) involve the participation

Figure 1. *Location of the Mapu Lahual territory, province of Osorno, Chile*


600000
620000
5500000
5480000
5460000
© GOOGLE EARTH, 2024
▨ Area Rewe Mapu Lahual
☐ Limites Región
▨ Aldeas
— Red Vial
— Red Hidrográfica
Elaborado por: Alejandra Alvarez V.
Ranco
Osorno
Llanquihue
Chiloé
Palena
Aisén

Source: Author’s own elaboration
Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

of sons and daughters, which makes it possible to transfer the specialized knowledge of the *tejuelero* trade from one generation to the next.

Currently, in the territory it is possible to identify problems related to land tenure (Otarola *et al.*, 2006), the development of investment projects (such as real estate or infrastructure for local agricultural production), forest fires, and conflicts over the use of resources, among other issues. In this context, the communities seek to advance a territorial management model in which local actors work in an organized manner and engage with public services to improve family well-being. This model aspires to embody *küme mogen*[1], reflected in a balance between conservation and the product diversification associated with the terrestrial ecosystem (*Mapu*) and the marine–coastal ecosystem (*Lafken*).

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

Since its establishment in 2005, the main objective of the Mapu Lahual Indigenous Parks Network has been to sustainably use natural resources while maintaining and strengthening the ancestral practices of the Mapuche-Williche communities (Rewe Mapu Lahual Master Plan). Currently, management of the territory’s resources is being maintained. The communities use the goods and services of the ecosystem, promoting not only its sustainable use, but also its recovery and maintenance.

The main forestry activity is the extraction of dead alerce to produce *tejuelas*. In addition, the forests are used to obtain firewood and other timber and NTFPs.

Ecotourism (locally referred to as “nature tourism”) has been promoted in recent years, not only to showcase the area's scenic beauty but also to highlight the cultural value of the area and the relevance of long-term conservation. To facilitate visits, new trails have been added to the main trail – a 56-km route that runs through the entire Mapu Lahual area. Ecotourism has resulted in the development of products and services, such as lodging and locally sourced food, which are offered by community members.

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[1] *Küme mogen* is a Mapudungun term that roughly translates to “good living” or “good life.” In the context of indigenous Mapuche culture, it represents a holistic concept of well-being, encompassing harmony with nature, community cohesion and spiritual fulfillment.

As one interviewee pointed out, "It is necessary to broaden the economic base of families. Today, older adults, adults and young people are developing activities directly and indirectly linked to ecosystem services, including ecotourism, and this shows that progress can be made together."

2.2. Type and condition of forest and scale of operation

Ninety percent of the nearly 62 000 ha of Mapu Lahual is covered by native forest vegetation. An analysis using Landsat 8 satellite images revealed that the area and condition of the native forest has been maintained over the past 10 years (2013–2023). This is in line with the objective of maintaining and facilitating the recovery of the native forest. The establishment of forest plantations with fast-growing species has not been a major economic activity: only 0.8 percent of the Mapu Lahual area is covered by forest plantations, according to spatial analysis. Forestry activities are carried out mainly at the farm level and individually in the communities. However, in some cases, forest management is implemented in common-use areas (e.g. in the Manquemapu community). Such cases focus on alerce extraction by community members under a single management plan.

Local stakeholders understand that the goods and services provided by the forest ecosystem not only satisfy basic needs but can also be the basis for social and economic development in the communities. Although agents of degradation, such as fires, firewood extraction and grazing livestock, are present in the area, the communities seek to avoid practices like burning or intensive felling that negatively impact the native forest. Maintaining a respectful relationship between humans and the environment is fundamental and intrinsic to communities. "The worldview of our people leads us to visualize the conservation of the *ñike mapu* [mother earth] as a whole, and of which people are a part", said the late Carlos Paillamanque, the leader (*Lonko*) of Lafken Mapu Lahual who passed away in 2025.

2.3. Legal status and management structure

Communities have documented and recognized ownership of their land, but there are challenges associated with individual ownership of the land (whether formal or by right of ancestral use) at family level.[2] While this situation does not restrict activities at the territorial level, it can pose legal limitations for certain initiatives. For example, it may hinder the formal approval of forest management plans or access to subsidies and productive incentives provided by the state.

On the other hand, the management of the area and the promotion of the community's vision have been strengthened by other community-level organizations. One example is the Corporation for the Conservation of the Coastal Range, which has recently joined the Mapu Lahual Indigenous Association. Led mainly by young people, the organization seeks to complement ongoing efforts in the area by further developing ecotourism. It has proposed to improve connectivity and strengthen alliances with other actors, such as public institutions, to support project development or discuss topics of interest to the communities.

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[2] The regularization of properties includes both individual and community tenure.

2.4. Regulatory environment and government support

Since the foundation of the Mapu Lahual Indigenous Parks Network, the indigenous communities have maintained a link with public institutions. In forestry, the state-owned National Forestry Services (CONAF)[3] has contributed to a joint management process with alerce growers, embodied in a manual for the use of alerce. This manual was distributed to local communities involved in dead alerce extraction in the Los Lagos region.

The National Forestry Services continues to facilitate the application of the forest promotion instrument established by the Native Forest Law (N°20.283/2008). This enables individual or joint owners (who have their properties legally registered by authorities) to access economic resources for forest management. The initiative focuses on the extraction of timber and NTFPs, as well as on the establishment of trails for ecotourism.

In recent years, the Proyecto +Bosques[4] – a forest management initiative involving CONAF and FAO – has strengthened the relationship between the communities and CONAF to support the development of forest management activities. Luis Cárdenas from CONAF explained, "The Proyecto +Bosques Program is working in prioritized territories in Mapu Lahual, and on technical aspects and other requirements of the communities." This has increased the number of forest owners, as well as the area under forest management.

In addition to the connection between forestry institutions and communities, public institutions responsible for agriculture, the environment and tourism, among other sectors, have engaged local communities in programmes and projects. These initiatives focus on infrastructure for local agricultural production, capacity building in productive value chains, and environmental education related to the marine–coastal conservation area of Lafken Mapu Lahual.

The results support the territorial management model, which integrates ecosystem conservation with forest management. Furthermore, the territory has been designated as a Strategic Development Zone under the Los Lagos 2030 Regional Development Strategy. This designation provides an opportunity to coordinate public institution actions related to land regularization, forestry, tourism development and other key areas.

2.5. Forest management practices

In Mapu Lahual, the communities benefit from various forest goods and services that are regulated and promoted by forest legislation. As a part of this process, forest owners develop a forest management plan for extracting dead alerce-wood with the support of CONAF's Forestry Extension Program. Community members extract a specified quantity of alerce tiles each year, as outlined in the annual management plan.

For more than 20 years, the alerce extractors have applied extraction practices that promote sustainable management. These practices are detailed in the manual jointly prepared by CONAF and the indigenous communities of Mapu Lahual. "Currently, the management plans allow the extraction of 10 000 to 15 000 tiles per year from dead alerce. In the past, extraction exceeded 100 000 tiles, which was not sustainable", explained an *alerce* extractor from the Maicolpué community.

Alerce extractors adhere to the prescribed practices because they are aware that bad practices could result in the annulment of the forest management plan. Such an outcome would lead to the loss of a vital income source or the illegal use of a protected species, if alerce harvesting continues beyond established limits.

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[3] For more information please visit www.conaf.cl

[4] For more information please visit www.masbosques.cl/wp

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Community-managed alerce forest in Mapu Lahual

Other forest management activities include those related to ecotourism (e.g. establishment of trails) and the collection of NTFPs (e.g. mushrooms) for self-consumption or sale in the local market. For the local communities, the collection of NTFPs is part of the culture and is seen as an opportunity to strengthen the conservation and recovery of the native forest.

2.6. Production and business aspects

In the Mapu Lahual area, individual and collaborative production and marketing models are being developed for products destined for local, regional and national markets. Local producers extract forest products for consumption or sale, including wood for construction, firewood and other uses, while other actors provide transportation services. In addition, there are groups that jointly manage the harvesting and marketing of forest products.

For example, in the Manquemapu Forestry Society, whose model has been maintained for more than 20 years, community members produce *tejuelas* in a common administration area within the community. Marketing is undertaken individually or collectively, depending on the opportunities that arise. Approximately 5 percent of the profits is given to the community organization to cover expenses related to the community (e.g. meetings and participation in events outside the community).

Small-scale agricultural production in the area has been maintained, while services related to tourism have progressively developed as an additional source of income. Affiliations in nature tourism have expanded greatly over the last 10 years, with a marketing chain that links various service providers, including tour operators, food producers and hiking guides. Ecotourism development has benefited the entire Mapu Lahual territory, and public services and other actors (e.g. NGOs, universities) have coordinated with the communities to maintain and grow tourism-related services and marketing chains.

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*Alerce tiles (***tejuelas***) produced by the community*

2.7. Social aspects and impacts

The development of activities linked to the forest ecosystem (including forest management and tourism) has had positive impacts for families in the communities. The sustainable extraction of dead alerce allows alerce growers to maintain their activity and generate income. In addition, nature tourism provides an opportunity for capacity-building within communities, particularly for women and young people, who receive support from external organizations through various initiatives.

In recent years, more young people between the ages of 20 and 25 have stayed in or returned to the territory to engage in activities linked to nature tourism. Javier Ancapan from Manquemapu community explained, “Before, people emigrated from the area. Today they have returned for the development of nature tourism. If the communities disappear, the forests are left to the mercy of other uses.” The direct and indirect benefits associated with forest management and conservation underline the value of forests and encourage the next generation to sustain these efforts.

In terms of local governance, the Mapu Lahual Indigenous Association has been joined by other organizations to promote the cultural and ecological importance of the area and to advocate for the opportunities and needs of the communities before decision makers. This collaboration has enabled territorial actors to participate in processes such as the discussion of bills (e.g. the Biodiversity and Protected Areas Service Law passed in 2024) and to represent the region at the Latin American level in the ICCA Consortium[5] (a consortium of territories and areas conserved by Indigenous Peoples and local communities), which includes representatives from 80 countries.

2.8. Environmental values and impacts

Forest activities, particularly non-extractive activities such as nature tourism, have helped to increase the value of ecosystem services and strengthen the vision of *küme mogen*. Local actors, both individually and collectively, work to implement practices that promote forest recovery and conservation. Key actions include avoiding the use of fire, expanding trails within native forests, and using forest products for food purposes, among other practices that align with this local vision. Local campaigns are organized to raise awareness about forest maintenance, which is critical given growing external pressures on forestland.

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[5] For more information please visit www.iccaconsortium.org/es/inicio

Local communities perceive the effects of climate change in terms of changes in precipitation patterns and recognize that forests are fundamental for the conservation of water resources. “Where there is more forest, there is usually greater availability of water. The forest is a sponge, and the water that falls stays, and because of this situation, the maintenance of the forests (trees, lichens, bushes, etc.) is important”, explained an interviewee from Caleta Cóndor.

Community members value the ecosystem and the cultural heritage associated with alerce. In this regard, local actors have begun an initiative to establish an Alerce Museum in the territory, for which they are seeking resources. This initiative will exhibit not only the historical significance of alerce but also the dynamic interactions between the communities and the forests within the Mapu Lahual territory.

2.9. Challenges and threats

One of the biggest challenges in the territory is land tenure at the individual level for a portion of the communities. Although this is a sensitive issue and is highlighted in the Rewe Mapu Lahual Master Plan, there are currently no processes that focus on the recognition of ancestral property rights for the communities. Interviewees pointed out that resolving land tenure issues could prevent or mitigate possible conflicts related to initiatives outside the social and cultural context of the territory (e.g. real estate projects). Another issue is land regularization at the family level, which can restrict forest management activities for the sake of compliance with national regulations (for example, in Chile, land ownership is required to obtain a forest management plan).

Trails in the communities of Manquemapu and Mapu Lahual

RED DE SENDEROS TURÍSTICOS
EN BOSQUE NATIVOS
COMUNIDAD INDÍGENA MANQUEMAPU
SENDEROS CON DIFICULTAD MEDIA
METROS
6 LOS CAJONES
+569 9304 3024
660- 1440
7 EL RAYO
+569 9210 3863
1500 - 1730
8 EL MELÍ
+569 4011 2202
1400 - 2500
BOSQUE NATIVO
PROHIBIDO EL INGRESO A LOS SENDEROS SIN AUTORIZACIÓN
CONAF
130
TREKKING
NO INICIAR FUEGO
NO SOLTAR MASCOTAS
ZONA PARA PANORÁMICAS
ZONA PARA FOTOS

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A further challenge is in ensuring that the actions designed and executed by community intermediaries and decision makers align with the communities' vision and needs (e.g. connectivity and productive investment). External investments in large-scale tourism and megaprojects dissonant with the communities' way of life also pose a potential threat.

2.10. Opportunities

From a conservation perspective, one opportunity is the recently promulgated Biodiversity and Protected Areas Service, which could provide legal and institutional support for terrestrial and marine–coastal conservation in the territory.

Regarding the use of forest resources, the current implementation of the Proyecto +Bosques enables the maintenance and replication of activities linked to the use of forest goods and services. It also conveys the importance of conservation and the sustainable management of forests. In addition, NTFPs present an economic opportunity directly linked to nature tourism. Their use promotes food sovereignty involving small-scale farmers. The active participation of women in productive activities – for example, in planting and maintaining orchards to produce food for consumption and sale – makes it possible to reinforce the cultural vision of a balance in the distribution of roles and benefits.

From the perspective of governance, the emergence and active involvement of young people in running organizations and representing the territory in discussion forums paves the way for longer-term continuation and the broader dissemination of the message.

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2.11. Partnerships

Successful local partnerships are exemplified by relationships with the Corporation for the Conservation of the Coastal Range and other local organizations working together under a common vision and shared interested in developing specific activities, such as tourism. These organizations contribute significantly to the work of the Mapu Lahual Indigenous Association in project development and to discussions of issues of territorial interest before decision makers at the community, regional and national levels. In addition, Mapu Lahual is present in the ICCA Consortium, which reinforces its presence in technical advocacy and political dialogue.

These collaborations offer a platform to showcase four decades of territorial progress, while also fostering active community engagement and local leadership. These relationships encourage the involvement of new stakeholders and the formation of alliances that can bolster the shared vision for territorial development and ecosystem conservation.

2.12. Innovation, recognition and outreach

Mapu Lahual stakeholders have participated in national and international seminars, as well as other venues of global representation (e.g. at the United Nations and the Inter-American Institute for Cooperation on Agriculture). In these spaces, they shared their experience and the value of conserving nature and cultural heritage.

In addition, researchers from national and international universities have carried out a number of studies in the area. These explore local governance, forest management and the development of ecotourism as a strategy to promote ecosystem conservation.

The 2006 practical manual on alerce use helps promote and replicate good practices. It highlights the work and results obtained by the Mapu Lahual communities in the sustainable management of alerce forests.

Finally, the designation of the territory as a Strategic Development Zone in the Los Lagos 2030 Regional Development Strategy is a recognition of its ecological importance and underscores the interconnections among the social, economic and cultural aspects of the territory's forest and marine–coastal resources.

3. KEY LESSONS LEARNED

- Having local leadership and an intergenerational approach is essential for the sustainable management and conservation of forest resources. Effective communication and a strong link between experienced and emerging community leaders enables the transfer of accumulated knowledge, relationships and learnings to the next generation of leaders. This intergenerational transfer can inspire new strategies that contribute to the fulfilment of the territory's vision and objectives.
- Valuing the forest ecosystem as a provider not only of goods but also of services steers management actions towards planning and executing processes that prioritize the functionality of the ecosystem. This approach strengthens messaging on the importance of maintaining a balance between meeting the needs of individuals and communities and conserving the forest ecosystem.
- Positioning the management and conservation of forest ecosystems as a means to foster and strengthen sustainable value chains creates avenues for traditionally marginalized groups – such as youth and women – to participate in initiatives, assume leadership roles and engage in decision-making processes at the local or community level.

4. FUTURE OUTLOOK

Mapu Lahual territory will continue to stand out both from cultural and productive perspectives. The local communities have acted in a coordinated manner to develop and implement actions based on the sustainable use of the forest and equitable distribution of benefits. The creation of new organizations, the development of sustainable productive systems compatible with forest conservation, and an openness for innovation are recognized as aspects that will continue to contribute to effective management of the forest ecosystem. Sustainable management of the forest, serving as the foundation for socioeconomic and cultural endeavours in the region, will sustain livelihoods amid environmental changes.

At the same time, local stakeholders have identified constraints hindering wider access to benefits derived from partnerships with public institutions, alongside the land tenure issues facing the Mapuche-Williche communities of Mapu Lahual. In response, local leaders are re-evaluating the governance model established three decades ago, acknowledging the imperative to adjust and innovate in light of evolving circumstances, external pressures and emerging opportunities within the territory. This adaptation is crucial for nurturing *küme mogen* and the ongoing sustainable management and conservation of the forest resources in Mapu Lahual and Lafken Mapu.

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LATIN AMERICA AND THE CARIBBEAN

COMMUNITY CONCESSION MODEL IN GUATEMALA LEADS TO SUCCESSFUL FOREST CONSERVATION

Fernando Carrera and **Roger Villalobos**, CATIE

NAME OF FOREST	**San Andrés Management Unit**
LOCATION	**Municipality of San Andrés, Petén, Mayan Biosphere Reserve, Guatemala**
AREA (ha)	**52 940**
MANAGING ENTITY	**Forest Association of San Andrés Peten**
MANAGEMENT OBJECTIVES	**Integrated forest management for production of timber and non-wood forest products**
FOREST TYPE	**Native subtropical forest**

1. INTRODUCTION

The San Andrés forest management unit is one of the 13 community forest concessions that have been operating for more than two decades in the Maya Biosphere Reserve (MBR). The concession has just been renewed for another 25 years as a result of good performance. The evaluation conducted in the San Miguel concession aligns with the consistently strong performance observed across all concessions within MBR. This success can be attributed to the effective leadership of the Association of Forest Communities of Petén (ACOFOP) and the steadfast support provided by the National Council of Protected Areas (CONAP).

The 2.1 million ha belonging to MBR are divided into:

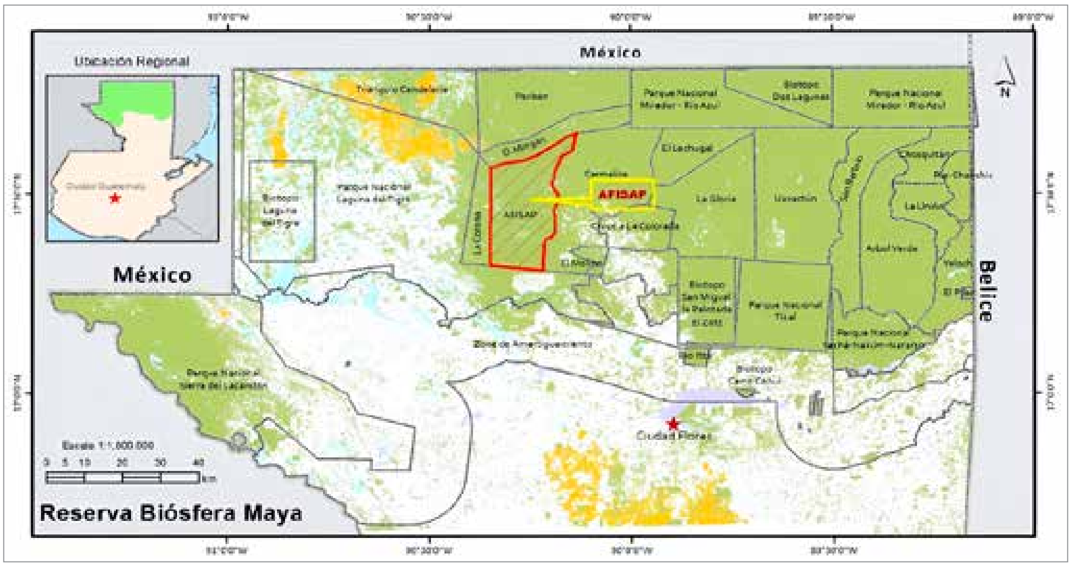
- a buffer zone, where private property predominates and various productive activities and urban growth are allowed;
- a multiple use zone, where there are national parks and only tourism is legally permitted; and
- forest concessions covering more than 500 000 ha, where forest management is permitted.

There are two types of community forest concessions: those that house resident human populations; and those in which the concessionaires live outside the forest management unit and are not allowed to carry out agricultural work in the forest area, as is the case of the San Andrés concession.

In the San Andrés concession, timber resources are managed with 40-year cutting cycles. The wood is sawn, dried and sold, mostly in the international market, taking advantage of market niches generated by forest certification. The management of non-timber resources, such as leaves of the xate palm (*Chamaedorea* spp.), breadnut or ramon tree nuts (*Brosimum alicastrum*) and fruits from the allspice tree (*Pimenta dioica*), is less developed in this concession due to limited accessibility, especially during the winter.

The 40-year cutting cycle was defined based on the growth rates observed for the main timber species, applying a conservative approach to safeguard the structure of the forest. Although the concession renewal period is shorter than the

Figure 1. *Location of the Forestry Association of San Andrés Petén concession, San Andrés, Guatemala*


México
Ubicación Regional
Triángulo Candelaria
Paxbán
Parque Nacional Mirador - Río Azul
Biotopo Dos Lagunas
Parque Nacional Mirador - Río Azul
El Lechugal
Carmelita
AFISAP
La Gloria
Uaxactún
La Unión
Arbol Verde
Yaloch
Biotopo Laguna del Tigre
Parque Nacional Laguna del Tigre
La Corona
AFISAP
Cruce a La Colorada
El Molino
México
Biotopo San Miguel la Palotada El Zotz
Parque Nacional Tikal
Parque Nacional Yaxhá-Nakum-Naranjo
Zona de Amortiguamiento
Biotopo Cerro Cahuí
Parque Nacional Sierra del Lacandón
Ciudad Flores
Belice
N
Escala 1:1,600,000
0 5 10 20 30 40
km
Reserva Biósfera Maya

Source: Rodas, A., Alegría, R. & Zac, W. 2017. *Desempeño económico y dinámicas sociales en las concesiones comunitarias de la Reserva de la Biósfera Maya. El Caso de: Asociación Forestal Integral San Andrés, San Andrés, Petén*. Petén, Guatemala, Biodiversity International, ACOFOP, Rainforest Alliance.

Note: Refer to the disclaimer on page ii for the names and boundaries used in this map.

cutting cycle, concessionaires must respect the harvesting intensities allowed in each cutting block. Their performance is monitored annually through forest certification audits and by CONAP to allow the continuation of activities.

The concession has been granted to the Forestry Association of San Andrés Petén (AFISAP), a non-profit organization whose revenues are reinvested in social actions, such as education and health, as well as in control and surveillance, in accordance with an investment plan approved annually by the board of directors and monitored by CONAP. The association has 165 members.

Figure 1 shows how the forest concessions, including that of San Andrés, have managed to conserve the forest, effectively resisting deforestation and deterioration that are prevalent in the surrounding areas (the southern buffer area, the non-concession area of El Triángulo de la Candelaria, and the national parks of Laguna del Tigre and Sierra del Lacandón). The national parks that are surrounded and protected by concessions (Mirador Río Azul and Tikal) are well preserved.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

According to the general management plan, the overarching forest management objective is to conserve forest resources through the participation of rural residents and with the application of socially acceptable and ecologically sustainable management techniques. This objective has been maintained since the initial approval of the concession.

The management plan establishes five specific objectives:

- promote the sustained and integrated management of the various forest resources;
- provide the community of San Andrés with an economic alternative through their participation in forest management;
- engage community members in protecting the area's natural and cultural resources; and
- promote more advanced processing of wood, including species of low commercial value.
- Establish a drying facility for timber and non-timber forest resources, using an environmentally friendly drying oven that runs on electricity and is built with wood.

An objective not explicitly outlined in the management plan, yet actively pursued, is AFISAP's commitment to social responsibility through enhanced welfare of the local population. This primarily involves initiatives in education, healthcare and the creation of employment opportunities.

2.2. Type and condition of forest and scale of operation

Agricultural use of the forest management unit is prohibited in the San Andrés concession. However, land use change and accidental fires have occurred in small sections in the past, resulting in degraded forest areas that are currently in recovery, where harvesting is not conducted (**Table 1**).

The concessionaires live outside the forest area and are committed to ensuring sustainable use of the territory, complying with the stipulations of the general management plan, especially in controlling illegal extraction and avoiding forest conversion. Forest cover to date has been maintained in accordance with the concession contract.

The annual harvesting areas are just over 1 000 ha. Only 1.5 m^3/ha is harvested, and 45 percent of the volume harvested is mahogany (*Swietenia macrophylla*), which is abundant and in demand in the market. It is notable that the number of species harvested has increased from fewer than five to 20 in recent years. The increase is not due to a depletion of the mahogany, whose populations remain healthy, genetically diverse and with the appropriate structure (Alarcón-Méndez *et al*., 2023; Cornelius *et al*., 2005; Grogan *et al*., 2017), but to an opening of the market to more species. The use of previously underutilized species contributes to the ecological and economic sustainability of forest management. The legally defined percentage of harvestable commercial trees that must be kept in the forest is respected (CONAP, 2021; Stoian *et al*., 2018).

Table 1. *Land use in the San Andrés Management Unit, 2020*

LAND USE	AREA (ha)	%
Forest	45 255	87.1
Forest in recovery	6 538	12.6
Water bodies	147	0.3
Total	**51 940**	**100**

Source: CONAP (Consejo Nacional de Áreas Protegidas). 2021. *Informe final de Evaluación de Desempeño de la Unidad de Manejo Concesionada San Andrés/ Asociación Forestal Integral San Andrés Petén (AFISAP) 2020.* CONAP, Petén, Guatemala.

2.3. Legal status and management structure

The San Andrés Management Unit granted to AFISAP in 1999 as a concession for a period of 25 years has just been extended by CONAP for another 25 years. This extension is the result of both strong performance and a positive relationship between community members and CONAP. Intervention by ACOFOP was essential in achieving the extension.

2.4. Regulatory environment and government support

When CONAP granted the first concessions in the MBR, there was uncertainty about forest management and use being an effective tool to contain deforestation. After more than two decades, these doubts have dissipated, and the government now recognizes forest management as one of the most successful actions to counter deforestation. However, there are always opponents of forest management who propose the creation of new parks in the concession areas.

The National Council of Protected Areas has a robust monitoring and evaluation system based on principles, criteria and indicators that consider the following aspects: (i) forest management; (ii) territorial management; (iii) financial administration; (iv) social responsibility; and (v) institutional regulations. This monitoring system is onerous and requires substantial effort on the part of CONAP technicians to execute it effectively.

One of the aspects that differentiates this process from others in Latin America is the requirement for mandatory certification to retain the concession. This requirement has been a key to the strong performance of the management units, since it has led to more than 20 years of continuous improvement in forest management practices in compliance with the FSC forest management standard. This ongoing compliance has enhanced the credibility and transparency of the forest management process.

2.5. Forest management practices

Forest management is based on a minimum cutting diameter system with a 40-year cutting cycle. Reduced impact logging practices are carried out, which include a commercial timber tree census, liana cutting, marking of seed trees, directional felling, the planned opening of skid trails and logging yards, controlled skidding and road closure. After use, logging yards are rehabilitated through direct sowing or planting of mahogany seedlings. No enrichment planting or release treatments are carried out after harvesting since the natural regeneration is abundant, ensuring the sustainability of harvested species over time (Carrera *et al.*, 2018; CONAP, 2021).

There are three scales of management planning: (i) the general management plan based on forest inventory of the entire concession area; (ii) five-year plans based on inventory of the intervention area in the next five years; and (iii) annual operational plans covering the area to be harvested each year.

The five-year plan is a newly introduced practice. It represents an improvement because it rigorously defines the area of intervention for five years and helps prevent excessive harvest in areas with high densities of mahogany. To maintain stable mahogany production over time, operations are planned considering the spatial distribution pattern of mahogany over the entire usable area.

At present, the management unit solely utilizes timber resources; however, AFISAP has begun to explore the untapped potential of non-wood forest products as part of the ongoing revision of the integrated management plan. This update considers opportunities to use chicle, ramon and xate palm as valuable resources. Chicle (chewing gum), the edible resin of the *Manilkara zapota*

Xate palm leaves collected and sorted for sale

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Harvested logs being transported by truck from the San Andrés community forest concession

tree, has a long tradition of use in the area. Ramon nuts, an ancient food used by the Mayan culture, are used and marketed by other concessions to make desserts, food supplements, beverages and other products. The leaves of the xate palm are mainly sold in the United States of America for ornamental purposes.

2.6. Production and business aspects

In the beginning, trees were sold standing as the community group did not have the necessary harvesting and processing equipment to enable them to capture greater value. Today AFISAP has its own harvesting equipment (wood saw and drying oven) and is capable of producing products such as tongue-and-groove boards, mouldings, flooring, handrails, false ceilings, internal linings and external wood cladding. Most of the extracted wood is sold abroad, mainly to the United States, taking advantage of its forest certification. Around 20 species are used, the five main species being mahogany, cedar (*Cedrela odorata*), Santa María (*Calophyllum brasiliense*), manchiche (*Lonchocarpus castilloi*) and pucté (*Bucida buceras*).

An important commercial development is the creation of the Empresa Comunitaria de Servicios del Bosque S.A., which is a private, community-based company that provides services in wood processing, marketing and product commercialization. This company brings together seven concessions, all of which are cooperatives and associations, under group certification covering a total certified forest area of 249 085 ha in Petén. This reduces certification costs for each concession and allows for better control of operations.

2.7. Social aspects and impacts

The Forestry Association of San Andrés Petén has 165 members, of whom 129 are men and 36 are women. As this is a non-resident concession, the majority of the members live in the urban centre of the municipality of San Andrés, which allows them to complement their livelihoods with other sources of income outside the concession. In monetary terms, the concession contributes 17 percent of

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Sun-drying of sawnwood at the Forestry Association of San Andrés Petén wood processing facility

the total income of AFISAP members (Rodas *et al.*, 2017). Yet, the advantages of the concession extend beyond mere labour income. These benefits are evidenced through various programs and activities, including:

- educational support programmes for its partners, workers and family groups incorporated into the investment plan;
- health benefits (e.g. insurance, medications, and support in case of illness) according to the investment plan;
- promotion of the participation of women and young people in management, administrative and operational capacities; and
- promotion of new productive projects or businesses compatible with the environment to increase economic benefits, for example beekeeping and tourism practised on a 45-ha AFISAP property in the buffer zone, with plans to develop the project area into a study centre.

2.8. Environmental values and impacts

Guatemala has an annual deforestation rate of 0.54 percent, which represents 19 500 ha/year according to the Global Forest Resources Assessment (FAO, 2020). In contrast, deforestation in the concession area is zero, and the forest is recovering (Hodgson *et al.*, 2015). A study of the populations of five of the most harvested timber species in the MBR shows that the current management regimes in the concessions do not compromise the long-term maintenance of these species (Grogan *et al.*, 2017).

The large size of the concession, along with the low level of exploitation (not harvesting more than the forest grows), implementation of reduced-impact logging techniques and the strict surveillance programme to prevent illegal logging and poaching, have resulted in positive environmental impacts. These benefits include the conservation or enhancement of populations of key fauna species such as jaguars (*Panthera onca*), peccaries (*Tayassu pecari*), tapirs (*Tapirus bairdii*) and agutis (*Agouti paca*) in the concession area compared to surrounding areas (Polisar *et al*., 2017; Tobler *et al*., 2018).

The forest in the concession area is in better condition than in the neighbouring protected areas, many of which are being invaded illegally by people seeking land, drug traffickers or people who settled there through former government programmes. The communities regard the concession forests as a valuable source of income and are therefore committed to their conservation under SFM principles (Carrera *et al*., 2018; Stoian *et al*., 2018).

Every year, AFISAP presents a control and surveillance plan to CONAP, as well as a plan for the prevention and control of forest fires. As a result of these plans and their implementation, there is no illegal exploitation or land use change in the concession, and forest fires have been kept to a minimum (Davis and Sauls, 2017; ACOFOP, 2017).

2.9. Challenges and threats

Until 2022, the main problem with the San Andrés concession and the other concessions in the MBR was uncertainty surrounding the extension of the 25-year concession contracts. In 2023, the concessions were extended for 25 more years. While this represents significant progress, it does not guarantee the continuity of the concessions since instability is created with each change of government. Such transitions are often influenced by interests that are contrary to forest management, including calls for the repeal of concessions to expand national parks, such as the Cuenca del Mirador National Park.

The main challenges faced by AFISAP and the concession process in general are not technical, as these have been resolved over time. The main problems lie in the needs to strengthen community forestry enterprises with a long-term business vision and to strengthen the value chains of both timber and non-timber products.

2.10. Opportunities

This case study is a good example to share in other regions of Latin America and the world. It demonstrates the need for political support to start the initiative and transfer management responsibility to organized communities. This political support must go hand in hand with financial support. The concessions had strong support from international cooperation at the start, specifically the USAID, which invested large sums of money in the 1990s to make the initiative viable for several years.

The Association of Forest Communities of Petén can support the dissemination of the adopted approach through community forest management courses given by the community members themselves, with the support of organizations dedicated to education and teaching such as the Tropical Agricultural Research and Higher Education Center (CATIE). In recent years it has received support from the Mayan Cultural and Natural Heritage Foundation.

Another opportunity lies in the sale of carbon through REDD+ projects. While the current management approach does not rely on carbon funding, participating in such initiatives can support the development of monitoring and evaluation systems, and help communities offset some of the costs of forest management, control and surveillance.

2.11. Partnerships

It is essential to have second-tier organizations that bring together and support the communities in carrying out forest management. In this case, that role is played by ACOFOP, whose support has been instrumental; without it, the concessions might not have reached their current level of development.

The legal status of “association” adopted by AFISAP has been maintained since its creation more than two decades ago and has given good results. This status does not allow the distribution of dividends resulting from management, so profits are mostly invested in improving the quality of life of the members in terms of education and health.

The Forestry Association of San Andrés Petén has proven to have an efficient administration that is able to motivate its associates in the management of the concession. The communities have become very knowledgeable about the management of timber and non-timber products and have developed a positive attitude towards forest conservation.

2.12. Innovation, recognition and outreach

The San Andrés concession, together with the other concessions of the MBR members of ACOFOP, have been recognized and awarded for their performance. These awards include recognition for leadership in conservation in Latin America granted by National Geographic, Innovation Markets Project recognition from the Consultative Group on International Agricultural Research, a certificate of excellence from the United Nations Development Program equatorial initiative for Biodiversity Conservation and Poverty Reduction, the International Union for Conservation of Nature environmental torch for leadership at the Latin American level on environmental issues, the Sasakawa Prize awarded by the United Nations in Nairobi in 2011, and recognition from the FSC and the National Council of Sustainable Forest Management Standards for Guatemala for achievements and for using forest certification as a mechanism for the conservation of MBR forests. In November 2022, the concession process was linked to the Latin American Model Forest Network.

The community concessions have widely shared their knowledge and experience acquired over more than two decades of development. They receive groups from various countries interested in topics related to forest management. The model of the concession process in Guatemala has been taken as a reference to stimulate forest management in other countries, such as in Colombia, where community forest management has been promoted as part of peace agreements after armed conflicts.

Perhaps the greatest impact of forest management in the concessions has been the conservation of forests with community participation, highlighting that sharing rights and responsibilities with the local population can be an effective approach to development and conservation.

Although the concessions were granted in order to minimize the change in forest use two decades ago, a recent study (Castillo *et al.*, 2020) showed that they contribute to achieving the 17 Sustainable Development Goals. Nevertheless, their approach has not been sufficiently promoted and there is still ignorance about it, even in Guatemala.

3. KEY LESSONS LEARNED

- Involving the local population in the management of forest resources has proven to be an effective way to conserve forests and their biodiversity.
- Development has required a lot of time, large investments, alliances with multiple actors and a broad commitment of local actors.
- Good social governance with leadership continuity has been key to success.
- The large size of the concession allowed for long cutting cycles (40 years) and large annual cutting areas that make management economically viable.
- The 25-year tenure term is relatively short for forest management processes. Tenure should be granted for at least one cutting cycle, in this case 40 years.
- In all MBR concessions, concessionaires respect the permitted cutting intensities, not only because of effective controls, but also to ensure periodic renewal of the concessions in recognition of their good performance. Furthermore, many of them aspire to be granted full possession from concession status. Such expectations have helped to maintain good management processes to date.

- Forest certification has contributed positively to the success of the management, allowing for improvements in forest management and market access.
- Product diversification and value addition are key to generation of employment and income.
- The promotion of new productive projects and businesses compatible with the environment has increased the economic benefits for the organization.

4. FUTURE OUTLOOK

The future prospects of the forest are promising in the medium term thanks to CONAP's decision to extend the concessions for another 25 years. This extension will ensure proper management and use during this period. However, there is a latent fear among concessionaires that political changes could jeopardize this situation, since each change of government generates uncertainty about whether ongoing commitments will continue, even when good outcomes and indicators are reported.

Climate change is resulting in a decrease in the water regime, which increases the risk of forest fires. The concessionaires are aware of this threat and are investing considerable resources in fire prevention and control. They recognize that if the forest burns, they will be the main victims.

At first, the management of the concession concentrated on the use of mahogany. Today, it is clear that productive diversification is key to continuity. The number of species used has increased and more value is being added. Now, there is diversified production with value chains of timber and non-timber products, as well as tourism.

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LATIN AMERICA AND THE CARIBBEAN

ZAMBRANA-CHACUEY, COLINAS BAJAS: A PROCESS THAT TRANSFORMED A COUNTRY'S LANDSCAPE AND CHARACTER

Fernando Carrera and **Roger Villalobos**, CATIE

NAME OF FOREST	Zambrana-Chacuey Agroforestry Producers Association, Colinas Bajas
LOCATION	Municipality of Cotuí, the Dominican Republic
AREA (ha)	875
MANAGING ENTITY	Zambrana-Chacuey Agroforestry Producers Association
MANAGEMENT OBJECTIVES	Industrial wood production; multiple use; biodiversity conservation; socioeconomic benefits for communities
FOREST TYPE	Forest plantations and agroforests

1. INTRODUCTION

The case of the Zambrana-Chacuey Agroforestry Producers Association (APA) is very special. It is the story of farmers who were once enemies of the forest but since became foresters who depend largely on forest plantations for their livelihoods. Although the forestry microenterprise or cooperative formed by the Zambrana-Chacuey APA in 1992 has declined to a condition of minimal activity since 2015, the process cannot be seen as a failure, as it opened the way for 26 other small sawmills in the territory to begin productive forestry activities. This has turned the area into a centre of forestry development in the country, serving as an example and influencing forestry policies.

The territory went from being a completely deforested area, as a consequence of over-exploitation and tenure policies that prohibited forestry activities, to being a restored territory with greater forest cover and agroforestry systems based on *Acacia mangium* as the main commercial species. Nevertheless, there are still extreme conservation groups in the country that oppose forest production, which they equate with forest destruction. They do not understand that the best way to promote reforestation is to support the productive use of trees grown by the communities, which enhances the value of the forest.

2. KEY CHANGES AND DEVELOPMENTS

2.1. Management objectives

The initial objective of the Zambrana-Chacuey APA was to form a small forestry company based on planted *A. mangium* wood. Although this company later suspended its activities because of administrative problems, it brought about a positive change in the landscape and culture of the area, transforming a completely degraded landscape into community forest plantations incorporated into the local economy and the way of life.

The evolution of Zambrana-Chacuey APA and management priorities can be divided into six phases:

- ***Phase 1 (1984–1988): Introduction of agroforestry systems.*** In 1984, the Zambrana-Chacuey Peasant Federation started implementing a participatory pilot project introducing fast-growing species and multiple-use fruit and timber trees, particularly *A. mangium*, native to Papua New Guinea and Australia.
- ***Phase 2 (1988–1992): Expansion and diversification.*** There was widespread reforestation with fast-growing species and large volumes of biomass and wood becoming available. The project then established a sustainable forest management unit, which integrated more than 650 small producers. At that time, the first certificates for harvesting plantation timber in the country were obtained from the government, which was a significant milestone after years of an obstructive policy that prohibited forest harvesting.
- ***Phase 3 (1992–1998): Forestry microenterprise.*** In 1992, the APA was founded with more than 600 members. That same year, the Zambrana Forest Microenterprise project was designed and started, which installed the first community sawmill in the country and was the first initiative that used 100 percent planted wood. The project served as a stimulus and model for other communities. The ability to obtain a plantation certificate with the right to harvest had a significant impact, especially since the producers did not need to have a land title to obtain the certificate. Few people in the territory had land titles.
- ***Phase 4 (1998–2009): Towards autonomy.*** In 1998, the process of self-management of agroforestry systems began, through associated community microenterprises. In 2009, this process was proposed to FAO and in 2010 was evaluated as an exemplary case of sustainable forest management.
- ***Phase 5 (2009–2016): Support from Barrick Gold and ENDA.*** The international organization Environment and Development Action (ENDA),[1] decided to promote the participation of communities in the management of forestry microenterprises by forming a multiple-services agroforestry cooperative called Cooperativa de Producción Agroforestal Zambrana-Chacuey (COOPRAZAC, stylized as Cooprazac), in which the APA is the largest shareholder. The cooperative, ENDA and the mining company Barrick Gold made a tripartite agreement to execute the project between 2012 and 2016. One of the activities of the project was the conversion of the sawmill, which worked with a circular saw, to a modern Wood-Mizer brand belt mill in 2014.
- ***Phase 6 (2016–2023): Decline of the cooperative Cooprazac.*** With the departure of ENDA's support, the cooperative declined and then collapsed due to poor management coupled with the COVID-19 pandemic. However, it has not completely closed operations and still has the sawmill and 80 to 100 ha of *A. mangium* among its assets. Its managers recognize that there was a lack of commitment, poor financial management, and neglect of controls since the times of financial prosperity. Despite Cooprazac's management problems, the landscape restoration process was highly successful, as shown by the enhanced forest cover and the development of a forestry culture in the area. This is evident from the 26 microenterprises that have replicated the model and taken advantage of the new forest resources.

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[1] For more information please visit www.endadom.org.do

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Deforested landscape in Colinas Bajas

2.2. Type and condition of forest and scale of operation

The territory went from being a deforested area with high rates of degradation to a wooded territory where forestry activity is part of the livelihoods of the local population. Between the beginning of the twentieth century to 2010, forest cover in the Dominican Republic declined from 85 percent to 36 percent of the territory. Although no specific official data was found for the study area, for the period 2005–2015, the country reported an annual net increase of 10 500 ha of forests (Emanuelli *et al.*, 2018). Deforestation occurred largely because of obstructive policies banning all timber harvesting. These policies were a reaction to uncontrolled exploitation of forest resources during the era of President Trujillo. During the next era, of President Balaguer, the military chose to prohibit legal forestry activity and thereby encouraged the elimination of remaining forests and discouraged reforestation by communities. This resulted in the farmers removing any type of forest regeneration (fallow) before it became a tall forest that could not be legally used. There was a widespread shortage of wood and firewood, and deterioration of the landscape.

The project promoted by ENDA brought several forest species to the territory for evaluation, including *A. mangium*, which showed extraordinary growth and great utility for farmers. When the demand for wood reached its highest point and wood shortage occurred, the farmers of Zambrana offered *A. mangium* wood. The military, which at that time oversaw the forestry sector, was perplexed since the cutting of trees of any type was prohibited, and the rule did not distinguish whether the wood came from natural forests or plantations. The acacia trees offered had been planted by the community, which was easily verifiable since they were exotic species. Political advocacy prompted the government to grant the community the first plantation certificate with the right to harvest.

This historic milestone changed the dynamics of the territory, as several supported farmers reforested massively with this species, obtaining harvests six years after planting. It is in this context that the first community sawmill in the country was established, adding value to the product. Originally, it was a small circular sawmill with low production and high fuel consumption; as indicated before, it was later replaced by a more modern one.

In conclusion, this process was one of restoration of a highly degraded landscape, a significant increase in tree cover, and the incorporation of forestry activity into the life strategies of the communities, making them more appreciative of having a diversified economy and a healthier landscape with better management of soils and water resources. At the same time, it is a process that had a positive impact on national policies, opening doors to sustainable forest production.

2.3. Legal status and management structure

The legislation changed from a total ban on all timber harvesting in the country to the management of plantations with the right to harvest. Many farmers introduced the forestry component to the agricultural work on their properties under the model promoted by the Zambrana-Chacuey APA.

Most of the *A. mangium* plantations were established on land owned by small farmers. Given the changes in policy, the APA formed the Cooprazac cooperative. In the beginning, the cooperative functioned well thanks to the external support from ENDA, with funds provided by the mining company Barrick Gold as part of its corporate social responsibility. The agreement signed in 2012 was for four years, but in 2016 the parties had disagreements with the company's actions and ENDA left the agreement. Problems began when ENDA's support was withdrawn, and Cooprazac had to assume the entire administration of the forestry company. As is often the case with community-based groups, Cooprazac was not prepared to take on that challenge, and currently the cooperative engages in minimal activity.

2.4. Regulatory environment and government support

The issuance of the first "Certificate of Plantation with the Right to Harvest" by the National Forestry Technical Commission in 1989 was a key milestone in improving the regulatory framework. However, tensions remain between many producers and the government technicians responsible for overseeing harvesting operations.

Producers question how the criteria for issuing logging permits are applied, arguing that officials often fail to recognize the contributions of local communities and lack understanding of the realities faced by foresters and small to medium-sized forestry businesses. They point to excessive costs, cumbersome procedures and, in some cases, demands for illegal payments.

Some stakeholders believe that no additional permitting procedures or payment should be required for harvesting planted trees – especially since such requirements do not apply to crops or other agricultural products. They also highlight the long delays in obtaining permits, which are supposed to take no more than 15 days but often stretch into several months.

According to Acosta (2020), policies that create obstacles to forestry exploitation endanger the achievements of restoration projects, despite their being one of the main sources of income for the local population. Many interviewees point out that state authorities do not show the slightest interest in promoting policies that encourage forestry use and simplifying the extensive bureaucratic processes that discourage the forestry industry.

2.5. Forest management practices

Acacia mangium is a forest species that spreads easily. In the territory of Colinas Bajas there are three main types of forest plantations:

- Most producers (80 percent of the total) are small scale, although they cover less than 10 percent of the forest area, with plantations of 0.3 to 0.5 ha each. They apply unplanned, minimal and rudimentary management based on the criteria and experience they have acquired, and they do not have technical assistance.
- Medium-scale producers account for most of the plantation area, mainly of *A. mangium* but also of *Gmelina arborea* and *Eucalyptus* sp., with plantation sizes ranging from 5 to 150 ha. They must comply with a management plan approved by the Ministry of the Environment through its provincial offices, and they usually pay for private technical assistance.
- Large-scale producers are about 10 companies focused on *A. mangium*, and they have the best technology.

There are also agroforestry systems that comprise a minimal part of the volume produced, and they combine *A. mangium* with subsistence crops such as banana, cassava, taro and pigeon pea.

In some cases, forests have grown from the natural regeneration of *A. mangium*. These forests are used but are not managed any further, and this occurs in degraded areas where the priority is not production. For planted forests, the practice of identifying seed-bearing individuals and collecting the seed from these selected trees was established from the initial phase of ENDA technical assistance. Larger-scale producers have been more rigorous in selecting such trees. Currently there are specialized private nurseries that collect seeds and produce trees for planting, mainly for medium-scale clients.

The main management practices include the selection of genetic material, land preparation by clearing and ploughing (medium or large producers), and thinning. Pruning is not common since *A. mangium* is self-pruning. The custom is to harvest the plantations and then replant, but the management potential of natural regeneration in plantations has not been evaluated. The common initial density is 1 600 trees/ha. A 40 percent thinning is done in year three and another 20 percent in year five, to reach a final density of 320 trees/ha. These are harvested when they are 25 to 35 cm in diameter. Although higher densities were tested for biomass production, the best results for both wood and biomass are obtained with the indicated density.

Since *A. mangium* is an exotic species, it is not accepted by the extreme conservation sector, which deters forestry production as a way of life for communities. One of the interviewees mentioned that the antipathy towards this species reached the point that, despite its importance and high consumption, the plantations of exotic species were not considered as part of the quantified forest cover in the latest national forest inventory.

Acacia mangium *on an agroforestry farm*

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Sawmilling of acacia logs at a microenterprise in Zambrana-Chacuey

2.6. Production and business aspects

The majority of the volume of *A. mangium* produced is used as biomass for energy, particularly those coming from natural regeneration and poorly managed plantations in livestock farms. Much of the wood from small producers is used for rough rural constructions, and the rest is used for the construction of tourist infrastructure. Chainsaws are used for timber harvesting. Medium and large producers also use tractors for hauling and hire personnel for the process, while small producers (80 percent of the total) use human or animal force, with family labour. For biomass production, the use of chippers is common in the field.

The wood intended for construction and other uses is purchased by sawmills. Only medium and large producers are able to invest in improved drying and brushing of the wood, as well as marketing. Provincial authorities focus on the permitting process and do not provide technical assistance. Primary forest production is not very profitable, with the owner receiving USD 8 per metric tonne of standing tree, while the sawmill can receive USD 60 per metric tonne for processed timber.

When ENDA's support for the administration of the microenterprise ended, weak local capacity for administration began to be evident. The leadership in charge saw many resources available but did not maintain the control processes and equipment. This period of decline culminated with the onset of the COVID-19 pandemic. Currently the forestry company is paralysed, but it is highly likely that it will be reestablished with the support of the mining company.

The emergence of 26 small sawmills and the Timberland Dominicana processing company has significantly transformed the landscape and forestry culture of the territory. These enterprises source wood from approximately 12 000 ha of reforested farms in Colinas Bajas, enhancing sustainable forestry practices and local economies.

2.7. Social aspects and impacts

The use of *A. mangium* has resulted in the emergence of new livelihoods in relation to the diversification of productive activities; at least that is the perception of the residents and technicians, but there are no studies that quantify this impact. These livelihoods include forestry production, wood transportation, sawmilling and carpentry (e.g. cabinet making).

The experience has enabled farming families to empower themselves in a development process and confront poverty through agroforestry and wood production, while stimulating changes in a restrictive forestry policy.

According to Gomez (2011), building human capital – particularly through the training of agroforestry promoters – helped guide the Zambrana-Chacuey experience towards a positive trajectory of endogenous development. As community members gained a deeper understanding of the potential of agroforestry systems as part of their livelihood strategies, this knowledge sparked innovation within those systems.

2.8. Environmental values and impacts

The landscape was transformed from a degraded and deforested territory in the 1980s, when the ban prevailed, to an area with tree vegetation and recovery of soils and water sources.

2.9. Challenges and threats

According to those interviewed, the main threats of the process in Colinas Bajas are as follows:

- Public officials at the regional and municipal levels have little social sensitivity and understanding of the value of forestry, its role in landscape restoration, and the efforts made by local communities. They are unfamiliar with the challenges and costs faced by small and medium-sized forestry enterprises, and they tend to complicate procedures, create unnecessary obstacles and, in some cases, demand illegal payments.
- A poorly informed environmentalist movement that stands opposed to forestry production and forest plantations of exotic species, despite the obvious changes in the landscape.
- Some companies, such as Timberland Dominicana, purchase raw materials from foresters in Colinas Bajas at low prices. While their communication with producers tends to be more efficient, this creates competition for small businesses that are already struggling to survive.

Formerly degraded landscape under restoration

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- In the last national forest inventory of the Dominican Republic (MARN, 2021), the true contribution of *A. mangium* was not included, apparently at the instigation of the conservation sector, according to those interviewed.
- Limited participation of young people in agroforestry activities, in addition to their continuous outmigration to the cities, is creating a marked absence of available labour in the area.

2.10. Opportunities

With the increase in tourism in the Dominican Republic, the demand for wood has grown, which constitutes an opportunity for the local population. The model created by the APA has been successfully replicated in other areas.

If political reforms are made to promote plantation management, there are excellent opportunities for forest management to increase in the area. This would also require raising awareness among various groups that directly and indirectly oppose plantation forestry activities and production.

2.11. Partnerships

The most evident change was the formation of Cooprazac, in which the APA is the largest shareholder. Although Cooprazac did not prosper, it is expected to recover with financial support from the mining company Barrick Gold.

2.12. Innovation, recognition and outreach

The greatest innovation of the case study was convincing the government to issue the "Certificate of Plantation with Right to Harvest", which overturned the harvesting ban and encouraged reforestation.

The case of the Zambrana-Chacuey APA was selected as one of the exemplary cases of sustainable forest management by FAO in 2010.

3. KEY LESSONS LEARNED

The study developed by Acosta (2020) provided the following lessons learned from the degradation and restoration processes of ecosystem services in Colinas Bajas:

- The existence of strong local organizations has proven to be a fundamental enabling condition for restoration in Colinas Bajas, and particularly in Zambrana.

Acacia mangium tree ten years after being planted

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- The development of local capacities is a priority issue in communities.
- The formation of specific organizations for forest management and exploitation constitutes a success factor in the restoration of ecosystem services.
- The identification of a methodology close to the community, learning from neighbours or peers, represents a successful strategy in restoration programmes.
- Alliances between public institutions, the cooperative and ENDA represent an enabling condition for restoration.
- Grassroots local leadership is key to achieving sustainable governance for the restoration of ecosystem services in Zambrana and more broadly throughout Colinas Bajas.
- Provincial and regional public officials must promote forest management through the administrative simplicity of granting harvesting permits for plantations.
- Awareness must be raised at all levels that forestry production through forest plantations is beneficial for the territory regardless of whether the species with which it is reforested is native or exotic. Forest use improves the cover and environment, in contrast to the original degraded grasslands, and there are no studies that show a specific significant negative effect of these plantations in the area.

4. FUTURE OUTLOOK

Although the Cooprazac cooperative, formed from the Zambrana-Chacuey APA, did not function as expected due to administrative shortcomings in managing the microenterprise, the overall process was still successful. This is evident from its replication by more than two dozen microenterprises that have adopted forestry as one of the primary livelihoods for the local population.

However, actions must be taken in terms of administrative and managerial capabilities so that these micro companies do not suffer the same fate as Cooprazac. It is necessary to influence state institutions so that bureaucratic procedures and requirements that generate unnecessary and unfair costs for forestry activity are eliminated, and so that the authorization processes for logging are based on technical criteria rather than political ones. Ideally, institutions should provide technical, silvicultural, business and market support to forestry producers.

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www.fao.org/forestry/en/

Food and Agriculture Organization of the United Nations
Rome, Italy

ISBN 978-92-5-140138-5
9 789251 401385
CD7052EN/1/10.25

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Solutions for Inclusive Green Development
Soluciones para el Desarrollo Verde Inclusivo
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